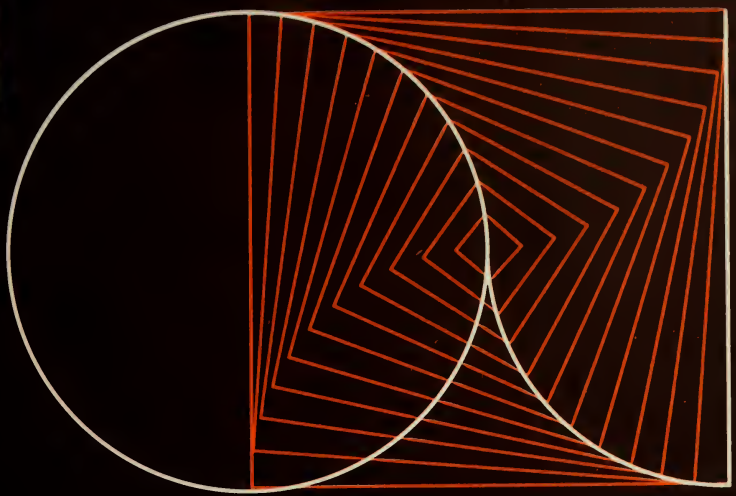

GRADUATE STUDY AND RESEARCH IN CIVIL AND SANITARY ENGINEERING

UNIVERSITY OF ILLINOIS BULLETIN JANUARY, 1969

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A Promising Future
through Graduate Study and Research

GRADUATE STUDY AND RESEARCH

IN CIVIL AND SANITARY ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF ILLINOIS, URBANA

JANUARY, 1969

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INTRODUCTION

The University of Illinois at Urbana, Illinois, was founded March 2, 1868, under the Land Grant College Act signed by Abraham Lincoln. In 1870, the College of Engineering was established. In 1871, the Department of Civil Engineering was organized and in 1872, four civil engineers were graduated.

Throughout the past ninety-eight years, the department has grown and maintained a high position among the best universities in the nation. Such excellence reflects the outstanding quality of the faculty, who offer the best in education at all levels, along with significant research contributions. The American Council on Education, in its 1966 report entitled "An Assessment of Quality in Graduate Education," recognized the distinguished reputation and prestige earned by the department. Graduate departments in all areas, including engineering, were rated by the American Council on Education. The Department of Civil Engineering graduate faculty was rated "distinguished." The department was rated the highest in the distinguished category at the University of Illinois and second in the country in the field of civil engineering.

The future for civil engineering at the University of Illinois is more promising than ever before, as the new multi-million dollar building and facilities are specially designed for graduate training and research.

The department offers challenging opportunities to qualified students working towards advanced degrees. Formal course work and participation in creative research enable the civil engineer with graduate training to go beyond the normal limitations imposed by the baccalaureate degree

and to be better prepared to contribute more to the progress of his profession. The graduate program places special emphasis on research training in the belief that this is one of the most valuable kinds of scientific engineering experience and training which can be gained by the student.

Recent scientific and industrial developments along with the increasing complexity of many phases of engineering have created a strong demand for civil and sanitary engineers with formal study beyond that offered in undergraduate programs. Among the fields of work for which graduate study is desirable and for which it prepares the engineer are: advanced analysis and design; consulting engineering practice; teaching of both fundamental and advanced courses in civil engineering, mechanics, and related fields; research and development in industrial laboratories, educational and scientific institutions, and governmental laboratories; and administrative responsibilities in various specialized fields.

This catalog contains essential information for those considering graduate study; however, it is recognized that some of the brief statements may generate questions. On specific problems or questions, students are encouraged to correspond with the:

Head, Department of Civil Engineering
1114 Civil Engineering Building
University of Illinois
Urbana, Illinois 61801

Advanced study, research, and professional training are offered in the following fields of civil and sanitary engineering: Air Pollution . . . Analysis and Design of Structures . . . Behavior of Structures and Properties of Structural Materials (Concrete, Steel, Timber, etc.) . . . Construction Engineering and Management . . . Digital Computer Applications to Analysis or Design . . . Geodetic Engineering . . . Highway Engineering . . . Hydrology . . . Hydromechanics and Hydraulic Structures . . . Materials and Structural Design of Roadways . . . Models Research . . . Nuclear Structural Shielding . . . Photogrammetry and Photogrammetric Engineering . . . Radiological Health . . . Railway Engineering . . . Rock Mechanics . . . Soil Mechanics and Foundations . . . Stream Analysis . . . Structural Dynamics: Design for Earthquake, Shock, and Blast Excitation . . . Structural Mechanics . . . Systems Analysis and Design . . . Traffic Engineering . . . Transportation: Planning, Systems Design, and Operations . . . Urban Planning and Management . . . Waste Water Treatment . . . Water Quality and Treatment . . . Water Resources.

Because of the extensive research programs directed by members of the staff in these and in related fields, excellent facilities for research are available for use by graduate students.

The degrees of Master of Science and Doctor of Philosophy may be attained by qualified students who satisfy the requirements of the department and the Graduate College. Progress toward an advanced degree is measured not only by the accumulation of units of credit in formal course work but also by evidence of intellectual growth and achievement. The main purpose of graduate study is to enable a student to broaden his knowledge of, and increase his competence in, a given field. Graduate study, especially in the second and third years of the doctorate, aims at the development of independent scholarship, originality, and competence in research, coupled with development of engineering judgment. Training of this type is fostered by close and frequent contact between the student and academic staff. The students' advisers in research and graduate studies in civil engineering are among the most eminent engineering teachers in the country. Because almost all staff members are directly involved in research, and are advisers to a relatively small number of students, close individual contact exists.

The large enrollment of graduate students from all parts of the world not only adds to the stature of the department, but also it makes it possible to offer a wide range of courses on all phases of civil and sanitary engineering. Graduate students in civil engineering at the University of Illinois are selected from the top students in the United States and foreign countries. The many domestic and foreign students contribute to the department a variety of experience, which broadens the outlook of all who are included in the graduate group. The knowledge and friendship gained from contact with this select group will be of importance and advantage to the student in his future career.

The staff, graduate students, and technicians in the Department of Civil Engineering are shown for the fall of 1968.

Full Professors 42	Research Assistants (F.T.E.)..... 9
Associate Professors 17	Graduate Students 256
Assistant Professors 30	Technicians and Employees.....23
Instructors & Research Associates.. 3	Secretaries and Others.....46
Postdoctoral Fellows 1	

The number of degrees awarded by the department in recent years is summarized below.

Degrees Awarded	*1966*	*1967*	*1968*
B.S.	101	120	101
M.S.	99	78	92
Ph.D.	39	29	33

Extensive research programs, involving an annual expenditure of almost two million dollars, enable students to participate in active research projects. Research is supported by the University as a part of its educational program for advanced undergraduate and graduate students. However, a large part of the research and graduate program is supported by special grants from various sponsors, including federal and state agencies, technical societies, professional associations, and research councils. Present sponsors include American Iron and Steel Institute . . . American Institute of Steel Construction . . . American Society of Civil Engineers . . . Asphalt Institute . . . Atomic Energy Commission . . . Automotive Safety Foundation . . . Chicago Bridge and Iron Foundation . . . Defense Atomic Support Agency . . . Department of the Air Force: Weapons Laboratory; Ballistic System Division . . . Department of the Army: Corps of Engineers; Omaha District; Waterways Experiment Station . . . Department of Defense: Office of Civil Defense . . . Department of Health, Education, and Welfare: Public Health Service . . . Department of the Interior: Bureau of Reclamation; Federal Water Pollution Control Administration . . . Department of the Navy: Naval Facilities Engineering Command; Naval Ship Systems Command; Office of Naval Research; Radiological Defense Laboratory . . . Esso Research Engineering Company . . . Great Northern Railway . . . Industrial Fasteners Institute . . . International Lead Zinc Research Organization Incorporated . . . Metropolitan Sanitary District of Greater Chicago . . . National Academy of Sciences-National Research Council: Earthquake Engineering Committee; Highway Research Board; Ship Structure Committee . . . National Aeronautics and Space Administration . . . National Science Foundation . . . Portland Cement Association . . . Raymond Concrete Pile Company . . . Research Council on Rivited and Bolted Structural Joints . . . State of Illinois: Department of Mental Health; Division of Highways . . . United Engineering Trustees Incorporated . . . United States Army Medical Research and Development Command; Office of the Surgeon General . . . United States Department of Transportation; Federal Railroad Administration; Federal Highway Administration . . . Welding Research Council.

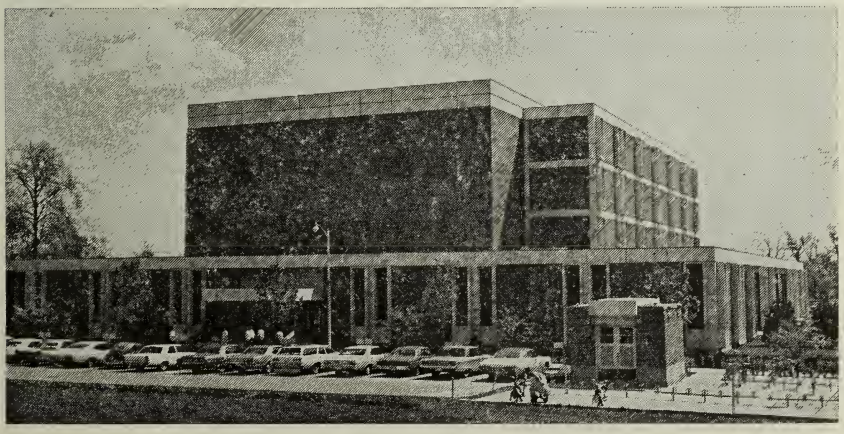
ADMISSION

Admission to the Graduate College with full status in civil or sanitary engineering is granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent to those of the University of Illinois, provided the applicant's preparation is appropriate to advanced study in his chosen major field and his scholastic average is at least 4.0.[1] This average is computed on the basis of the last sixty semester hours, or 110 quarter hours, of credit recorded.[2] In computing grade-point averages, evidence that the school's grading system is based on a different datum is considered. Under certain conditions applicants with a grade-point average of less than 4.0, and applicants from schools with different grading systems, may be considered if their average is at least the equivalent of 3.75 and evidence is submitted indicating that the applicant's ability is not appropriately measured by the grades submitted. Such applicants should have their application accompanied by at least two letters of recommendation regarding their ability, and by such other evidence that they wish to submit.

Foreign students who rank in the uppermost portion of their graduating class and who have excelled scholastically are encouraged to apply for

[1] In converting to a numerical grade, the following equivalents are used: A = 5; B = 4; C = 3; D (minimum passing grade) = 2.

[2] All hours of credit are included for all courses in the semesters, quarters, or summer sessions involved in the last sixty semester hours, or 110 quarter hours, of undergraduate work and accordingly the total of hours used in the average may be greater than that noted. Courses failed and subsequently passed must also be included.



The Civil Engineering Building on the Urbana campus.

admission by forwarding their application and appropriate credentials indicating their academic standing. In addition, students must submit evidence of their ability to fully support themselves while in residence at the University. Proficiency in English, as evidenced by the results of the TOEFL (Testing of English as a Foreign Language) examination, must be provided before the student's admission can be finalized.

Admission to graduate courses may be granted only to those who have had the requisite undergraduate work in those courses. Students without adequate preparation may be required to take, without credit, certain undergraduate courses.

Students from the United States. Students who are citizens of the United States can obtain admission application forms from the Graduate College, the Office of Admissions and Records, or the Department of Civil Engineering. Students should request, if needed, a copy of the University of Illinois Graduate College catalog when the application forms are requested. To avoid delays, a prospective student is urged to submit his application at least three months in advance of the opening of the session in which he plans to enroll.[3] A student whose native language is not English should submit his application well in advance of the anticipated registration date in order to provide time to take and obtain the results of the TOEFL examination. An official transcript from each undergraduate college attended must be forwarded. In addition, all graduate students entering the Department of Civil Engineering should arrange to have one additional set of transcripts forwarded to the department office for its records and use. An official statement of rank in class, and rank in college, also should be submitted.

Students from Foreign Countries. The prospective student who ranks in the uppermost portion of his graduating class and who excels scholastically will be asked to fill out an application form "Application for Admission for Applicants From Other Countries," and submit this along with all supporting credentials, transcripts, etc. The student must also supply information on his rank in his graduating class.

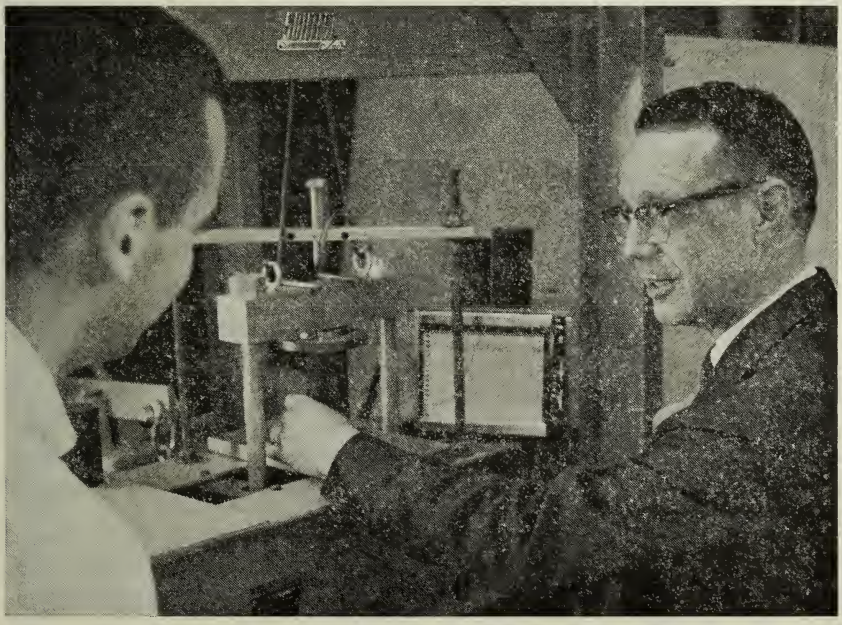
Students must be able to understand and be understood in English, both written and oral. The University of Illinois requires that a passing score on the TOEFL examination, administered by the Educational Testing Service, Princeton, New Jersey, four times a year throughout the world, be presented for admission. The results of other English examinations are not acceptable for admission purposes.

[3] For approximate enrollment date, see the calendar on page 63.

In some cases, a placement examination in English is required at the time of registration on the campus. When indicated by the placement examination, non-credit English courses are prescribed. Registration in these non-credit courses reduces accordingly the number of credit hours for which a student may register; this usually extends the time for completing degree requirements.

The Director of the Office of Foreign Student Affairs (address inside back cover) assists students from abroad with problems involving passports, visas, and other matters.

Admission with Advanced Standing. Upon the recommendation of the head of the department and with the approval of the Dean of the Graduate College, admission with advanced standing is granted to applicants who have completed a master's degree or the equivalent elsewhere and who desire to become candidates for the doctor's degree at the University of Illinois. A candidate for admission with advanced standing must meet the minimum standards noted above, and must exhibit an excellent record in his advanced work. The department desires, and may require, that a student supply in support of his application for advanced standing an official record of his Aptitude and Advanced Engineering scores in the



The creep properties of a bituminous mixture are being determined by Professor M. Herrin and a graduate student in the highway materials laboratory.

Graduate Record Examination administered by the Educational Testing Service, Princeton, New Jersey 08540, U.S.A. The record supplied must be for an examination taken during the preceding year.

REGISTRATION AND PROGRAM OF STUDIES

Registration. Dates for registration in the Graduate College are shown on the abbreviated calendar on page 63. Registration material and special instructions are available from the department office during the scheduled registration days or at any time thereafter.

Advisers. Each graduate student is assigned an adviser who assists in planning and carrying through a program of graduate work which fits his needs and satisfies departmental and Graduate College requirements. The adviser for research assistants is normally the staff member in charge of each assistant's research program.

Unit Credit for Courses. Graduate credit is measured in terms of units. One unit is considered the equivalent of four semester hours. The normal program for a full-time graduate student is four units each semester; the maximum permissible is five units. The normal program for an eight-week summer session is two units, with two and one-half units being the maximum permitted. The amount of credit which may be earned in individual courses is indicated in the course listing beginning on page 43.

Work Completed Elsewhere. A candidate for the doctorate who has received a master's degree from a recognized institution enters at Stage 2 with Stage 1 completed. (See page 19.) However, the student is responsible for all work covered previously and will be examined on the content of the courses involved at the time of the preliminary examination.

A student who has done graduate work in a recognized institution, but without receiving a degree, may petition to obtain credit toward an advanced degree by passing examinations in this work. Admission to such examinations requires the approval of the department and of the Dean of the Graduate College. The acceptance of credit for work completed elsewhere does not reduce the residence requirement for an advanced degree.

Upon recommendation of the department, the Graduate College may permit a student to register in absentia for work at a laboratory elsewhere that offers facilities not available in the Urbana-Champaign area. Such work is accepted for graduate credit if it is completed satisfactorily.

Miscellaneous Courses. A student carrying a normal graduate program may elect, in addition, one miscellaneous course (a course which does not give credit toward an advanced degree). If a graduate student enrolls for more than one miscellaneous course, he may not register for a full graduate program. Courses intended to teach graduate students a reading knowledge of French, German, or Russian are regarded as miscellaneous courses. A student who elects a miscellaneous course is required to register in it and do the assigned work.

Auditing Privileges. A graduate student is permitted to attend classes (other than laboratory courses) as an auditor, provided a form bearing the approval of the instructor and the Dean of the Graduate College is filed with the Records Section of the Office of Admissions and Records. He may not take the same course at a later date for credit.

Graduate Programs for Employed Students. A student who is employed can not expect to complete his academic work as promptly as one who devotes full time to his academic program.

The academic work carried by assistants and others on the University is limited by statute. Those employed outside the University are expected to reduce their programs of work in accordance with these regulations. The maximum amount of academic work is determined as follows:

UNITS OF MAXIMUM REGISTRATION

	Semester Load		*Summer Session Load**
Terms of Employment (Time)	*Normal Load*	*Maximum Overload Petition Required*	
Full time	1 unit	2 units	1 unit
Three-fourths	2 units	2¾ units	1¼ units
Two-thirds	2¼ units	3 units	1½ units
One-half	3 units	3½ units	1¾ units
One-third	3¾ units	4 units	2 units
One-fourth	4 units	4¼ units	2 units
None	5 units	5 units	2½ units

* Maximum load; no overload permitted.

Under exceptional circumstances, additional registration is permitted by the Dean of the Graduate College.

Time Limit for Advanced Degrees. A candidate for the master's degree must complete all requirements for the degree within five calendar years after his first registration in the Graduate College.

A candidate for the doctor's degree must complete all requirements for this degree within seven calendar years after his first registration in the Graduate College. A candidate who has received a master's degree else-

where must complete all requirements for the doctorate degree within five years after his first registration in the Graduate College. A student whose program of study is sufficiently interrupted after he receives his master's degree from the University of Illinois, and who later returns to work for his doctorate, will have five years from the date he returns to complete the degree requirements.

In general, the transfer of graduate credit from other institutions under circumstances not specifically defined above is considered a basis for proportionate reduction of the time allowed for earning a degree.

Graduate Study in the Summer. A limited number of civil engineering graduate courses are offered during the summer session, usually in structures, soil mechanics, and foundations. The courses offered vary from summer to summer, so that by careful planning, it is often possible to complete the requirements for the master's degree by summer study and make progress toward the doctor's degree. It is not possible to obtain a doctoral degree in civil engineering by attending only summer sessions.

Grades. Grades are recorded by letters as follows: for thesis research, S and U (satisfactory and unsatisfactory); for courses, A, B, C, D, and E (failure). A student with three units of grade below B is disqualified as a degree candidate. If he has received two but *less* than three units of grade below B, then all subsequent units he submits for the degree must be of A or B grade.

Grades on courses in which the required work is not completed in a given semester will be recorded as "Ex" (temporarily excused) or, in the case of thesis courses and other specially approved courses, as "Df" (deferred). Grades recorded as "Ex" will be automatically changed to "E" if they are not replaced with another better grade during the next full semester in which the student is registered.

Petitions. The normal procedures and requirements of the Graduate College are indicated in this catalog, but these may be modified occasionally for justifiable reasons. A student may petition for exceptions to various academic and administrative requirements to the Dean of the Graduate College, but he should do so only after consultation with his adviser and with the recommendation of the department. Forms may be secured through the Department of Civil Engineering office.

Multiple Degrees. No more than two graduate degrees will be conferred for work completed at the University of Illinois. This means that a student intending to obtain a doctorate should not enroll for a master's degree in more than one department.

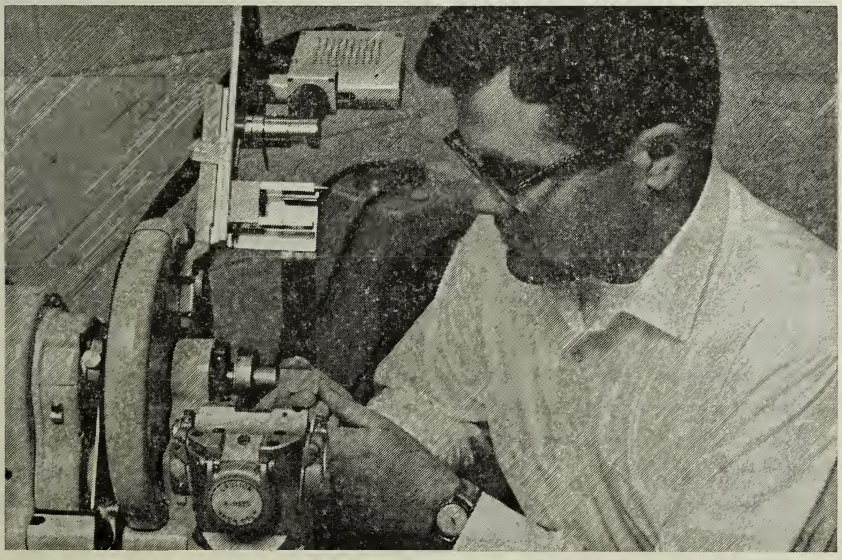
Conferring of Degrees. Advanced degrees are conferred in February, June, August, and October, except the Ph.D. degree is not conferred in August. Not later than two weeks before the degree is to be conferred, each candidate for an advanced degree must obtain and complete a clearance paper from the Graduate College office.

THE DEGREE OF MASTER OF SCIENCE

The degree of Master of Science is offered in the fields of civil engineering and sanitary engineering.

Credit Requirements. A candidate for the master's degree must complete at least eight units of graduate work with satisfactory grades. Three of the eight units must be in courses numbered in the 400 series, and two of these three must be in the major field. A total of at least four units must be in the major field. When a thesis is not elected or required, the candidate must present at least nine units of course work.

Residence Requirements. A candidate for the master's degree must spend at least two semesters in residence and must earn at least half of the required units while in residence. Attendance during four summer



A sample of clay is being placed into an X-ray spectrograph for determination of its mineralogical composition by a research assistant.

sessions in each of which the student is registered for not less than one unit of work, or in one semester with not less than two units and two summer sessions with not less than one unit each, is regarded as the equivalent of two semesters in residence. Registration for more than two units in a regular semester, or for more than one unit in a summer session, does not shorten the time which must be spent to discharge the residence requirement.

Resident graduate work is important to the student in that he is associated with the faculty and other students who share common interests. In addition adequate libraries, laboratories, and other facilities are available for true scholarly achievements. The atmosphere of inquiry, concentration, and study can be achieved without a division of attention with other work or problems.

Majors and Minors. A candidate for a master's degree may do all his work in one field, or he may select a major and one minor, or a major and two minors. For a master's degree a major comprises work totaling a minimum of four units. Less than one unit of work does not satisfy the requirements for a minor.

Foreign Language. There is no foreign language requirement for the M.S. degree. However, during the first year of graduate study, a student who plans to become a candidate for the Doctor of Philosophy degree should qualify in at least one of the languages required in the Ph.D. program.

Thesis. If a student elects to prepare a master's thesis or is required to do so by the department, he should file the subject of the thesis at the Graduate College office at least six weeks prior to graduation. No more than three units of thesis credit may be included in an eight-unit program. Credit in thesis research can not be applied to a degree unless a thesis is submitted. For specific instructions with reference to the preparation and form of the thesis, the student should obtain at the Graduate College office a copy of the leaflet *Instructions for Preparation of Theses.*

Thesis Work on Leave of Absence. A student who has completed six units of course work in residence and who wishes to complete the thesis *in absentia* should consult first with his adviser. If the request meets with the latter's approval, a petition is submitted. The petition must include an outline of the proposed investigation and evidence that adequate facilities for pursuing it are available. If the work is to be done in an industrial laboratory, it is necessary to secure a letter from the company releasing to the University all patent and publication rights.

Suggested Programs. Suggested programs in the various fields in civil engineering and sanitary engineering begin on page 57.

THE DEGREE OF DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy, primarily a research degree, is offered in the fields of civil engineering and sanitary engineering.

Residence Requirements. A doctoral program includes three stages. At least two of these stages must be completed in residence; the residence period must include two successive semesters in the second or the third stage.

The *first stage* is completed when the candidate has received a master's degree or earns the equivalent number of credits. The *second stage* consists of completion of a minimum of eight units of work, fulfillment of the major, minor, and the language requirements (if not completed earlier), and a successful preliminary examination. The *third stage* is devoted to research and seminars with a minimum of eight units of credit, preparation of the dissertation, and the final examination.

It is possible to complete these stages in three years if the student devotes full time to his academic program. For information concerning the maximum time allowed, see page 15.

Majors and Minors. A candidate is required to declare a major field of study and one minor (requiring at least four units) or two minors (requiring at least two units each). An area of specialization for a major can be interdepartmental. The requirements for a major or minor in any field should be checked with the adviser and department concerned.

Language Requirements. A candidate for the degree of Doctor of Philosophy must demonstrate a reading proficiency in two languages other than English, or a high degree of proficiency in one language other than English. Although French, German, and Russian are acceptable in all doctoral programs, candidates may be permitted in some cases to substitute other languages. A candidate should qualify in at least one of the required foreign languages during the first year of study. The entire language requirement should be satisfied early in the doctoral program and in any event no later than two months before the preliminary examination or during the semester (or summer session) preceding admission to the preliminary examination.

Students may satisfy reading proficiency by (1) direct examination or (2) by obtaining grades of A or B in French, German, or Russian 401, or by receiving an acceptable score on the Educational Testing Service (ETS) test in the language, or by being certified as proficient by a member of the faculty in the language department.

A student who wishes to satisfy the language requirement by a high proficiency in one language must pass a written-reading proficiency examination and must: (1) show ability to discuss his research and to answer questions in the language; (2) understand and give a résumé of what the examiner reads to him from material in his field; (3) carry on a conversation on the subject of his background and plans. Certification of proficiency in foreign languages from other colleges and universities is not accepted by transfer, although scores on the ETS Language Tests taken elsewhere will be accepted and evaluated as appropriate.

Preliminary Examination. A candidate for the doctor's degree must pass a preliminary written (in most areas) and oral examination to test his knowledge of his major and minor fields of study. He is not admitted to the examination before: (1) he has fulfilled the language requirement; (2) he has satisfactorily completed at least sixteen units of graduate work; (3) the staff of his major and minor fields of study consider that he has adequate preparation.

To maintain his status as a degree candidate, a student who has passed the preliminary examination must register each semester (summer sessions are excluded) until the degree is conferred.

Thesis. The degree of Doctor of Philosophy is primarily a research degree and consequently the candidate must demonstrate his capacity for independent research by preparing an original thesis on a topic within his major field of study. The subject of the thesis must be reported to the doctoral committee and to the Graduate College at the time of the preliminary examination.

When the credit requirement is satisfied (eight units of thesis research subsequent to passing the preliminary examination) the student maintains his status as a candidate by registering for either zero credit in Thesis Research (C.E. 499) or for an appropriate course load until completion of this requirement. The submission of petitions to the Graduate College requesting that credit in C.E. 499 taken prior to the preliminary examination be applied to the third stage of the program should not be necessary.

In the first place, if the candidate is utilizing any of the facilities of the University, including staff time, he should be registered for appropriate credit (or for the maximum credit allowed under the terms of his con-

tract) until such time as the thesis is completed. Secondly, a candidate who has completed a satisfactory thesis will be admitted to the final examination even though he has not completed eight units subsequent to the preliminary examination, provided he has carried the maximum credit allowed under the terms of his contract during the second and third stages. Thus, the circumstances would have to be most unusual to indicate that a petition of this type would be needed.

Directions regarding thesis form and style are given in the leaflet *Instructions for Preparation of Theses,* copies of which may be obtained in the Graduate College office. The candidate must submit to the Graduate College, no later than the date specified in the current calendar, (1) the original and first carbon (or two copies reproduced by an approved method) of his thesis and (2) one typewritten copy of an abstract of not more than six hundred words. In addition, two copies must be presented to the major department and one copy should be retained by the author.

Final Examination. After the credit requirements for the third stage and the thesis have been completed, the candidate is admitted to the final examination upon recommendation of the major department. A student who has failed to maintain high standards of scholarship and research is refused admission to the final examination. Although the examination is concerned primarily with the research accomplished by the student as described in his thesis, it may extend over the candidate's whole field of study. After successfully completing this stage, a $25.00 microfilm fee is charged which includes publication of the abstract in *Dissertation Abstracts,* and placing a copy of the thesis in the University of Illinois library.

FINANCIAL ASSISTANCE

Various types of financial assistance are available each year to promising graduate students. Detailed information about the qualifications and application procedures for these awards is given in the brochure *Financial Aid for Graduate Students.*

The University directly administers four principal types of financial aid for graduate students. These are: (1) appointments requiring service (including research and teaching assistantships), (2) fellowships (including traineeships), (3) tuition and fee waivers, and (4) loans.

Applications for graduate appointments and copies of *Financial Aid for Graduate Students* are available from departmental offices or the Graduate College Fellowship Office, 311 Administration Building, Urbana, Illinois 61801. Specially marked applications for National Defense Foreign Language Graduate Fellowships are available from Professor C. Ernest Dawn, Department of History, 350 Armory, Urbana, Illinois 61801.

Application Procedures. Only one University application form is needed to apply for any or all types of financial aid offered by the University. This one form may be used for fellowships, traineeships, teaching fellowships, assistantships (teaching or research), and tuition and fee waivers. To be considered for a fellowship, research assistantship, or tuition and fee waiver for an academic year beginning in September, the application and *all* supporting material must be returned to the Head, Department of Civil Engineering, by the preceding February 15. Although applications for assistantships are accepted after that date for any additional openings, applicants for such appointments are strongly urged to submit their papers as early as possible since most awards are offered at the same time that applications for fellowships are considered.

Civil engineering graduate students seeking financial support are required to furnish a statement of rank in class and rank in college. Forms for this purpose are available and are sent with application material. One form is to be filled out and returned by the applicant; the other one is to be filled out and returned by the appropriate school official.

Students may apply for more than one kind of appointment on the application and may indicate an order of preference in a note on the application. The department reviews these qualifications and preferences and determines the kinds of financial aid to be offered.

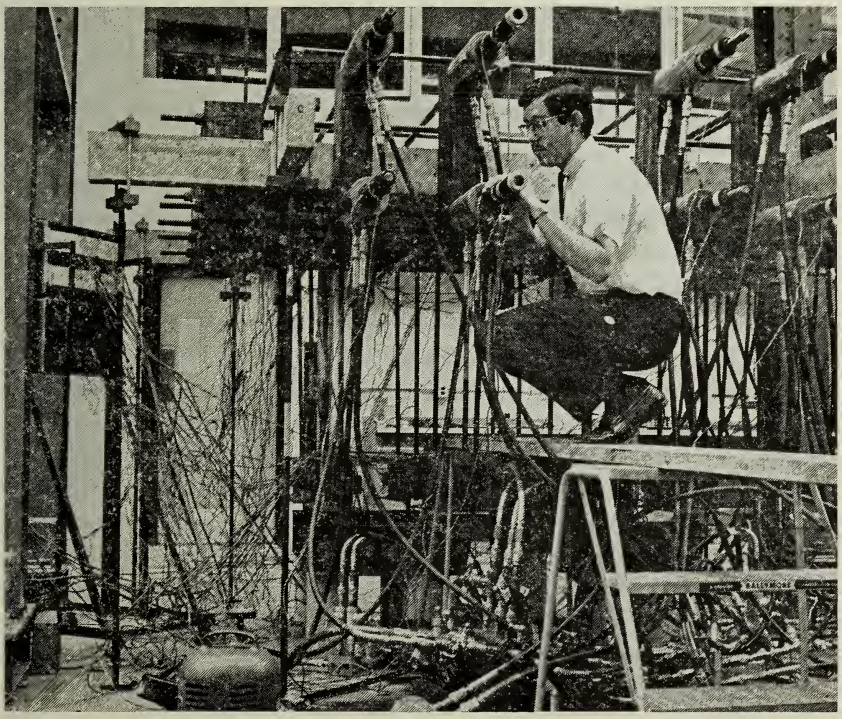
Applicants for financial aid whose native language is not English should note that their applications for admission and financial aid can not be processed until the results of the TOEFL examination are available. Thus the student seeking financial aid should have completed the TOEFL examination well in advance of February 15 preceding admission in September. This is to make sure that the score is on file with the University, so that his application may be considered in the financial aid competition.

Although it is not a requirement, students are advised that it is to their advantage to take the Graduate Record Examination, and specifically the Aptitude Test (Quantitative and Verbal), and the Advanced Engineering Examination, and have the results forwarded to the Department of Civil Engineering at the University of Illinois. Information as to when

and where the Graduate Record Examination is given (generally administered world-wide) may be obtained by writing directly to the Educational Testing Service, Princeton, New Jersey 08540, U.S.A. Applications are available in the Graduate College office, 330 Administration Building, Urbana, Illinois 61801.

Fellowships and Traineeships

Fellowships. Fellowship stipends are gratuities awarded in recognition of scholarly achievement and promise and are intended to enable a student to pursue his graduate studies and research without requiring him to render any services. The stipends of different fellowships vary as indicated below. The fellow's stipend and dependency allowances are legally regarded as gifts, not as compensation for services rendered, and are therefore exempt from income tax. Unless explicitly stated otherwise, all



A two-way slab specimen of reinforced concrete is being prepared to have its yield criterion tested by a research assistant, who will also analyze the data resulting from the tests.

fellows whose appointments are administered by the Graduate College are exempt from tuition and fees. A fellow is required to pursue a full program of graduate study (four units per semester) and may not engage in remunerative employment without the permission of the Dean of the Graduate College. However, most fellows are permitted to hold quarter-time teaching or research assistantships.

Traineeships. Traineeships are virtually equivalent to fellowships since the stipends are considered a tax-free gratuity. The stipends vary, depending on the recipient's level of study and area of specialization. Tuition and fees are also ordinarily covered. No duties are required other than those directly contributing to the training program.

Selection of Fellows and Trainees. Fellows and trainees are selected by the Graduate College Fellowship Committee on the basis of scholarship and promise in teaching or research. The first list of fellowship awards is announced about March 15. The University adheres to the resolution adopted by the Council of Graduate Schools in the United States which provides that if the recipient of an award indicates his acceptance before April 15, he will have complete freedom *through* April 15 to resign in order to accept another appointment. After April 15, however, he may not accept another award without obtaining a formal release from the first commitment.

It is understood that the award of a graduate appointment for one year involves no commitment for continued support by the University for subsequent years.

Departmental Requirements for Fellows. The department requires that all students holding fellowships or traineeships be engaged in some form of active research, either in association with one of the department's formal research programs, or on a special research program with his adviser. All students holding a first-year fellowship or traineeship must arrange to write a master's thesis (C.E. 499), or take at least one unit of Special Problems (C.E. 497), involving a comprehensive report on an individual investigation. This phase of the program provides the student with valuable training and serves as a guide to the department in making decisions about continuing studies and stipends. Second- and third-year fellows necessarily will be involved in research (and should be enrolled for credit accordingly) as a part of their doctoral study.

University Fellowships. These fellowships are awarded on the basis of an all-University competition and are unrestricted as to the student's field of graduate study. The recipient may choose either a nine-month or an eleven-month tenure. When tenure is for the regular academic

year, the fellowship carries a stipend of not less than $2,000 plus exemption from the tuition and fees. On the eleven-month basis (academic year plus the preceding or following summer session), the stipend is $2,500 plus exemptions. The department usually augments these fellowships by $400 for nine-month and $450 for eleven-month appointments.

Under certain conditions, University Fellows may engage in a limited amount of teaching, not to exceed one-quarter time. University Fellows must carry a full program of four units or the equivalent.

A number of summer fellowships which provide stipends of $500 plus the usual exemption from tuition and fees are awarded to teaching assistants. These fellowships are restricted to graduate students who have held teaching assistantships at the University of Illinois for at least half-time for both semesters of the preceding academic year, who have earned not less than two units nor more than six units of graduate credit during that year.

Industrial, Endowed, and Special Fellowships. Various industrial firms, foundations, and private individuals have generously donated funds to support a number of special fellowships for graduate students that provide stipends from $2,000 upward for an academic or calendar year. The stipends and supplemental allowances of these fellowships are not uniform, except that tuition and fees are usually provided. These fellowships vary from year to year but have included American Iron and Steel Institute Fellowship in structural engineering, American Oil Foundation Fellowship in civil engineering, American Society of Civil Engineering Fellowship in civil engineering management, Automotive Safety Foundation Fellowships in highway transportation engineering, A. E. Cummings Memorial Fellowship in civil engineering, Esso Research and Engineering Company Fellowship in civil engineering, W. E. O'Neil Civil Engineering Fellowship, and Resources for the Future, Incorporated, Fellowship in civil engineering.

National Science Foundation Traineeships. Under this program, grants are made directly to the participating institutions, who select a specific number of promising individuals for full-time graduate study. Appointments may be made only to citizens of the United States (or native residents of a United States possession) who are enrolled in the graduate program. Trainees must devote full time to programs leading to advanced degrees, and may be appointed for nine- or twelve-month tenure only.

Stipend for nine-month tenure: Level I, $1,800; Level II, $1,950; Level

III, $2,100. Stipend for twelve-month tenure: Level I, $2,400; Level II, $2,600; Level III, $2,800. A Trainee may remain at Level II for more than one year, but Level III is terminal. The allowance for each dependent is $375 for Trainees on nine-month tenure and $500 for Trainees on twelve-month tenure. Under certain conditions, National Science Foundation Trainees may engage in a limited amount of teaching or research.

National Defense Graduate Fellowships, NDEA Title IV. The University of Illinois Graduate College has a number of National Defense Graduate Fellowships which are financed under Title IV of the National Defense Education Act of 1958 and administered with the cooperation of participating departments. The purpose of the National Defense Graduate Fellowship program is to assist students who are preparing to teach in the nation's colleges and universities. Each fellowship, restricted to citizens or permanent residents of the United States, is for a three-year period to a student beginning his graduate studies, or for one- or two-year tenure for more advanced students filling vacated fellowships.

Stipend for nine months: Level I, $2,000; Level II, $2,200; Level III, $2,400; and an additional $400 for twelve-month tenure. Tuition and fees are paid. The dependency allowance is $400 for each dependent of a Fellow on academic-year tenure and $500 for each dependent of a Fellow on twelve-month tenure. An NDEA Fellow may accept, if offered, a supplemental quarter-time teaching or research appointment.

United States Public Health Service Traineeships. United States citizens pursuing a graduate degree in public health are eligible for Environmental Health Traineeships.

Stipend for twelve months: Level I, $2,400; Level II, $2,600; Level III, $2,800. The allowance for each dependent is $500. Tuition and service fees are paid by the grant.

Federal Water Pollution Control Traineeships. Through a grant to the University which is administered by the department, graduate students working in the area of water quality control are eligible for these traineeships if they are United States citizens. Stipends provide the same amounts as the U.S. Public Health Service Traineeships (above).

Tuition and Fee Waivers

These awards, available in limited number, provide exemption from payment of tuition and service fees, but not from the hospital-medical-

surgical insurance fee, for the academic year and the summer session immediately preceding or following. A graduate student may apply for a tuition and fee waiver by submitting an Application for Graduate Appointment to this department.

Students holding a tuition and fee waiver award must be in residence at the University and must register for at least three units each semester during the academic year. They may accept part-time or incidental employment not to exceed twenty hours a week. Employment may be at the University or elsewhere.

Veterans who are admissable to a graduate program and who meet certain residence requirements may be eligible for exemption from tuition under the state statute concerning military scholarships. Further information may be obtained from the Director of the Undergraduate Scholarship Program, Office of Student Financial Aid, 707 South Sixth Street, Champaign, Illinois 61820.

Assistantships

Research Assistantships in the Engineering Experiment Station. The Engineering Experiment Station is devoted to the study of problems of special importance to engineering and to the stimulation and elevation of engineering education. By undertaking a program of graduate study in close association with some one of the projects carried on in the station, the student comes into contact with aspects of his specialty which he would rarely touch in a purely academic study, and thus broadens his outlook.

Half-time research assistantships, with a stipend of at least $2,800 for an academic year of two semesters, are open to graduates of approved technical colleges and universities. Applicants to whom these assistantships are awarded devote one-half of their time to the work of the Engineering Experiment Station and one-half to graduate studies. Each appointment is made for one academic year and normally is extended to permit the requirements for the master's degree to be satisfied. In general, with a half-time assistantship, two academic years of residence are required in order to obtain the master's degree. Half-time or full-time work at a comparable rate for two and one-half months is sometimes available during the summer months. Thus, with an academic year half-time and a summer full-time appointment if available, an assistant's annual stipend during the first year could be $4,355, plus exemption from tuition and

fees during the academic year, but not the summer, if employed full time. Generally a commitment for a summer appointment can not be made in advance of the spring term preceding the summer session. A limited number of appointments are available, with prior arrangement, that permit completion of work for the master's degree by attending two consecutive summer sessions and the two regular semesters between them, or alternatively in three regular semesters.

Appointments to research assistantships are made only to students with outstanding records. Appointments are given to first-year and second-year graduate students, but only rarely to third-year students who have not previously studied at Illinois. Study toward the degree of Doctor of Philosophy also may be pursued by research assistants who have already received a master's degree and who satisfy the requirements of the department and the Graduate College.

Students holding academic appointments requiring service for more than 67 per cent time are required to pay tuition and fees. Thus those assistants holding full-time appointments during the summer must pay fees. Those whose appointments range from 25 per cent to 67 per cent of their time receive exemption from tuition and all fees, but not the hospital-medical-surgical fee. Assistants must carry a reduced program of study, as shown on page 15.

A number of research assistantships in civil engineering and sanitary engineering are available. These include assistantships established by the University, and others provided by cooperative research agreements with state and federal agencies, technical societies, and engineering associations.

Fields of research now active include all the programs shown in the introduction. Most programs have both experimental and analytical phases, and often both aspects are combined in order to permit broader training. It is usually possible to assign a research assistant to a project in the field of his special interest.

A thesis or research report is required at the master's level for all research assistants. Often the research in which he is engaged forms the basis of his thesis, but his thesis is not restricted to this field. Research assistants generally should register for special problems or thesis research during their first semester in order to gain additional experience in their area of research.

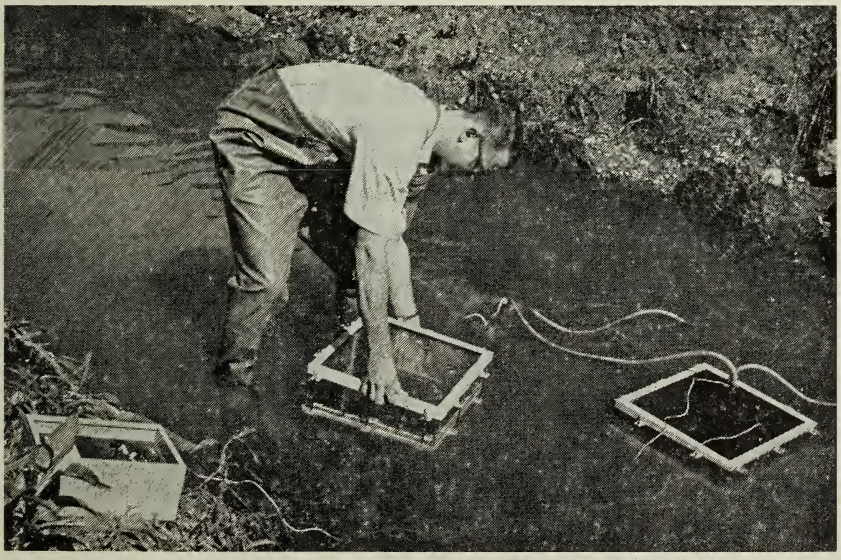
Applications for research assistantships should be made to the Head of the Department of Civil Engineering preferably not later than February

15 to be considered for appointments effective the following September. Applications received after this date are considered for any vacancies that may still exist. Although most appointments are made for the academic year beginning in September, some appointments may also be available in February or June.

Teaching Assistantships. In general, the department does not grant teaching assistantships to new graduate students. The normal procedure is to select teaching assistants from the research assistants who have served at least one semester in that capacity. Prospective graduate students who are interested in teaching should apply for a regular research assistantship and subsequently make their desires known to their adviser and to the head of the department.

Other Financial Aids

A number of other sources of support are available, for example, fellowships offered by the American Society of Civil Engineers, the American Institute of Steel Construction, and other organizations. Students are encouraged to apply for such stipends.



The effect of photosynthesis on polluted streams is being studied by a graduate student who designed and built the test chambers.

Loan Funds

Information and application forms concerning loans from the University, the National Defense Education Act, the Illinois Guaranteed Loan Program, and the United Student Aid Fund may be obtained from the Student Financial Aids Office (address on back cover). The amount of the loan which is finally approved by the Committee on Loans is subject to the availability of funds and the financial need of the applicant relative to all other applicants. Priority is given to students having the greatest need for financial aid, along with a strong academic background.

University Loans. A graduate student may apply to borrow from the University Long Term Loan Fund an amount not to exceed $1,000 per year or a total of $2,500. Loans are repayable, at a minimum of $30 monthly, at an interest rate of 3 per cent annually, beginning four months after leaving the University, with the requirement that all loans be repaid within four years.

National Defense Education Act Loans. Eligible graduate students may request financial assistance from funds provided to the University under Title II of the National Defense Education Act. The limit is $2,500 per year to a total of $10,000. Repayment begins in monthly installments, at an interest rate of 3 per cent annually, nine months after the borrower has ceased to pursue a full-time course of study, and the entire loan must be repaid within 10 years after repayment begins.

Up to 50 per cent of a National Defense Education Act loan will be cancelled if the borrower serves as a full-time teacher in a public or nonprofit private school in the United States. This applies to elementary or secondary schools and institutions of higher education. Such cancellation will be at the rate of 10 per cent of the loan for each academic year, or its equivalent, of such service. Also, if teaching service is performed in an elementary or secondary school officially classified as having a high percentage of students from low income families, cancellation will be at the rate of 15 per cent per year with no limit on total cancellations.

FEES AND EXPENSES

Tuition and other fees for 1969-1970 are indicated below, and are payable in full when the student registers, unless the installment plan of payment is elected. An additional charge of $2.00 is made for this privilege.

Tuition and Fees (Effective September, 1969)

Semester

	Full Program		*Partial Programs*			
	Range I		Range II		Range III	
	Above 10 hours Above 2½ units		Above 5 to 10 hours Above 1¼ to 2½ units		Above 0 to 5 hours Above 0 to 1¼ units	
	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident
Tuition (except those holding exemptions)	$123.00	$426.00	$ 87.00	$300.00	$51.00	$171.00
Service Fee[1]	40.00	40.00	25.00	25.00	10.00	10.00
Hospital-Medical-Surgical Fee[2]	16.00	16.00	16.00	16.00	16.00	16.00
Total	$179.00	$482.00	$128.00	$341.00	$77.00	$197.00

Eight-Week Summer Session

	Full Program		*Partial Programs*			
	Range I		Range II		Range III	
	Above 5 hours Above 1¼ units		Above 2½ to 5 hours Above ¾ to 1¼ units		Above 0 to 2½ hours Above 0 to ¾ unit	
	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident
Tuition (except those holding exemptions)	$62.00	$213.00	$44.00	$150.00	$26.00	$ 86.00
Service Fee[1]	20.00	20.00	15.00	15.00	5.00	5.00
Hospital-Medical-Surgical Fee[2, 3]	16.00	16.00	16.00	16.00	16.00	16.00
Total	$98.00	$249.00	$75.00	$181.00	$47.00	$107.00

[1] Persons on appointment for at least 25 per cent of full time on the academic, administrative, or permanent nonacademic staff of the University, or on the staffs of allied agencies, and persons registering *in absentia* or in courses conducted off-campus are exempt from the service fee.

[2] Students presenting evidence of equivalent coverage may receive a waiver of this fee upon approval of a petition submitted to the University Insurance Office not later than the final day established for full refund of fees. A signed waiver and assumption of responsibility is required. Persons registered for thesis research *in absentia* are not assessed this fee.

[3] If insurance coverage for the period between the close of the summer session and the beginning of the first semester is not desired, $8.00 will be refunded if requested in writing prior to the final date established for full refund of fees.

Noncredit Courses

Students who register in noncredit courses pay tuition and fees as follows: (1) Persons (except those holding exemptions) who register *on campus* for doctoral thesis research (Civil Engineering 499) only, without credit, are charged the following:

Semester and Eight-Week Summer Session

	Semester	*Summer Session*
Tuition	$10.00	$10.00
Service Fee	10.00	5.00
Hospital-Medical-Surgical Fee	16.00	16.00

(2) Persons who register for doctoral thesis research (Civil Engineering 499) *in absentia* without credit are charged only a tuition fee of . . $10.00

(Those registered *in absentia* for credit, pay the regular tuition, resident or nonresident, as applicable.)

(3) Persons who register in noncredit seminars, either alone or in addition to other courses . . . . . *No charge*

(Regular tuition and fees which are applicable are assessed for other courses taken concurrently.)

(4) Persons wishing to attend a campus course as a visitor only, pay for each course a fee of $15.00

Off-Campus Courses (field courses)

Students pay the regular tuition and hospital-medical-surgical fees. They are exempt from the service fee.

Nonresident Student Tuition Increase Effective September, 1970

In September, 1970, tuition will be increased for nonresident students. Total amounts for the Urbana campus will be as follows: Semester — Range I, $477.00; Range II, $330.00; Range III, $186.00. Eight-Week Summer Session — Range I, $239.00; Range II, $165.00; Range III, $93.00.

Residence Classification

The residence classification of an applicant is determined on the basis of information given on his application and other credentials. Tuition is assessed in accordance with this decision. If the student believes he has a legitimate cause for change of status, he may petition, on a form provided by the Office of Admissions and Records, to request a change. Petitions are considered within thirty days from the date instruction begins for the academic period for which the charge is payable. If the nonresident tuition was not assessed on or prior to that date, the claim for refund may be filed within thirty days after the nonresident tuition was assessed and the student was given notice of its assessment. Tuition and fees will not be adjusted for that academic term because of change in residence classification if the petition is not filed within these time limits. If the student expects to ask for a change of residence classification, it is advisable for him to request the adjustment be made prior to the registration period.

Further information concerning residency may be secured by contacting the Office of Admissions and Records, 100a Administration Building, Urbana, Illinois 61801. A brochure entitled *Regulations Governing Assessment of Resident or Non-resident Student Fees* is also available.

Special Fees

A partial list of special fees is given here which pertains to graduate students. A complete schedule of tuition, fees, and expenses may be obtained from the Office of Admissions and Records.

Late Registration Fine — $15.00. All students, whether on appointment or not, who complete registration for courses on campus after the close of the regular registration, are subject to this fine in addition to the tuition and fees. A student's registration is not complete until his tuition and fees have been paid in full, or he has made arrangement with the Bursar's Office for deferment of payment. Students who register late in any term pay the same tuition and fees as students who register at the beginning of the term.

Change of Program Fee — $1.00. This fee is charged for every course change slip issued at the request of the student after the completion of registration.

Microfilm Fee — $25.00. Each candidate who passes the final examination must pay this fee which provides for the microfilming of the complete

thesis, with one copy deposited in the University of Illinois Library, and publication of the abstract in the *Dissertation Abstracts*.

Vehicle Registration — $5.00 per year for a motor vehicle; the rate for a motorcycle, motor scooter, or motor bicycle is being established for 1969-1970. All resident students enrolled in the Graduate College who have these motor vehicles in their possession are required to register them with the Motor Vehicle Division. Bicycles also must be registered with this division. No fee is charged for such registration.

Transcript Fee — $1.00. Each student who has paid all his University fees is entitled to receive, without charge, one transcript of his record. For each additional transcript this fee is charged.

Refund of Fees

A student subject to tuition and/or fees who files clearance papers for withdrawal from the University during any semester, quarter, or summer session, for reasons other than military or other approved national defense service, may receive a refund. Consult the Graduate College catalog for details. (Special refund regulations govern withdrawals for active military or other approved national defense service.)

Estimated Expenses for One Academic Year

Urbana Campus	Moderate
Tuition and fees (residents of Illinois)	$ 358.00
Textbooks and other school supplies	110.00
Double room and board (residence hall rates)	935.00
Miscellaneous (including local transportation, provision for Sunday evening meal which is not included in University residence hall charges, and miscellaneous expenses)	470.00
Total, Two Semesters	$1,873.00

For those who are not residents of Illinois, the tuition and fees are $964.00.

HOUSING

The University has residence facilities in Arthur Hill Daniels Hall and Stuart Pratt Sherman Hall, two separate residence hall complexes for approximately 1,000 single graduate students, both men and women.

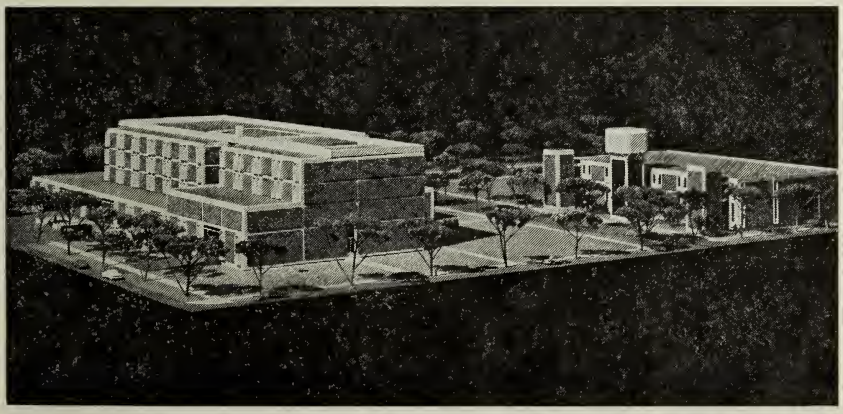
In one unit, Daniels Hall, contract food service in an undergraduate dining hall located directly across the street can also be arranged. In addition, the University provides a limited number of apartments for married students, with priority in assignment given to part-time research and teaching assistants.

Applications for accommodations in the University graduate residence halls or the University-owned apartments for married students may be obtained from the Housing Division, 420 Student Services Building, Champaign, Illinois 61820. The Housing Division also maintains a courtesy list of private apartments and rooms available in homes in the community.

BUILDINGS AND EQUIPMENT

Civil Engineering Building

The future holds much promise with the improved facilities and completion of various portions of the new Civil Engineering Building. The building provides office space for many of the staff and department offices. There is a test floor 47 by 85 feet for use by graduate students and by those conducting research. In this area are large machines for determining the fatigue strength of full-sized as well as scaled structural members and the strength of members subjected to rapidly applied loads. Modern



The architect's model of the Civil Engineering Building shows the Hydrosystems Laboratory at the right, which is nearing completion.

equipment is available for the study of dynamic behavior of structures as influenced by various forms of excitation, including vibration, impact, earthquakes, and blast. Extensive hydraulic loading facilities are important features of this laboratory. The laboratory contains electronic data reduction equipment, metallurgical laboratory, machine shop, and welding shop. There are also extensive facilities available in Talbot Laboratory to study the fundamental behavior of structures and structural components of wood, steel, and other metals, reinforced concrete, and prestressed concrete.

Concrete Laboratory. Located in the Civil Engineering Building, this laboratory is equipped for the study of the physical properties of concrete as influenced by proportioning, mixing, placing, curing, and environment. Large batch plants provide accurate and convenient service during research.

Soil Mechanics Laboratory. This laboratory is among the most complete in the world. Equipment for the performance of consolidation of pressures and model tests for investigating a variety of soil-structure interaction problems is available. Special equipment is available for tests in rock mechanics, and for chemical and rheological studies of soils.

Airphoto Interpretation Laboratory. Modern optical equipment for examining various kinds of aerial imagery is housed in this laboratory. Included are stereoscopes, ranging from the simple pocket type through mirror and scanning types, to the latest zoom type. The latter permits stereo viewing at continuously variable in-focus magnifications from 2.5 to 20 times. For the preparation of engineering maps, a vertical reflecting projector and a topographic plotter coupled to a mirror stereoscope are available. Precision mapping, with more refined photogrammetric equipment is available in the Photogrammetric Engineering Laboratory, which is a part of the department. Training in the evaluation of terrain for engineering purposes is greatly facilitated by a collection of several thousand photographs, stereograms, geologic maps, and soil maps representing landform areas throughout the world.

Sanitary Engineering Laboratories. These laboratories occupy more than 15,000 square feet of space in the Civil Engineering Building. They are equipped with modern precision instruments for the physical, biological, radiological, and chemical investigation of water, waste water, solid wastes, and air. In addition, spectrophotometers, Warburg respirometers, radiation counting equipment, a refrigerated high-speed centrifuge, a liquid scintillation counter, walk-in constant temperature rooms,

and a recording polarograph are available for use. Students have access to electron microscope, radiocarbon, and infrared analysis laboratory apparatus. Pilot plant facilities for water and waste treatment are used for instructional and research purposes.

Research in water treatment, treatment of domestic and industrial waste waters, solid waste disposal, air pollution control, and other aspects of sanitary engineering are being carried on in the laboratories. Opportunities to participate in the established projects and to pursue research independently on selected topics are offered.

Hydrosystems Laboratory. The Civil Engineering Building is being expanded and as a part of it, but adjacent to it, will be this new laboratory. Modern facilities as described in the section on the Hydraulic Engineering Laboratory will soon be available for study and research activities.

Structural Dynamics Laboratory

This is a special facility for dynamic tests at high pressures involving soil structure interaction and related aspects of dynamic loading. Pulse loading pressures (three milliseconds or longer), ranging up to 900 pounds per square inch, can be applied in a test tank that is 4 feet in diameter and 8 feet deep. Because of the type of tests being conducted in this laboratory, it is remotely located south of the main campus.

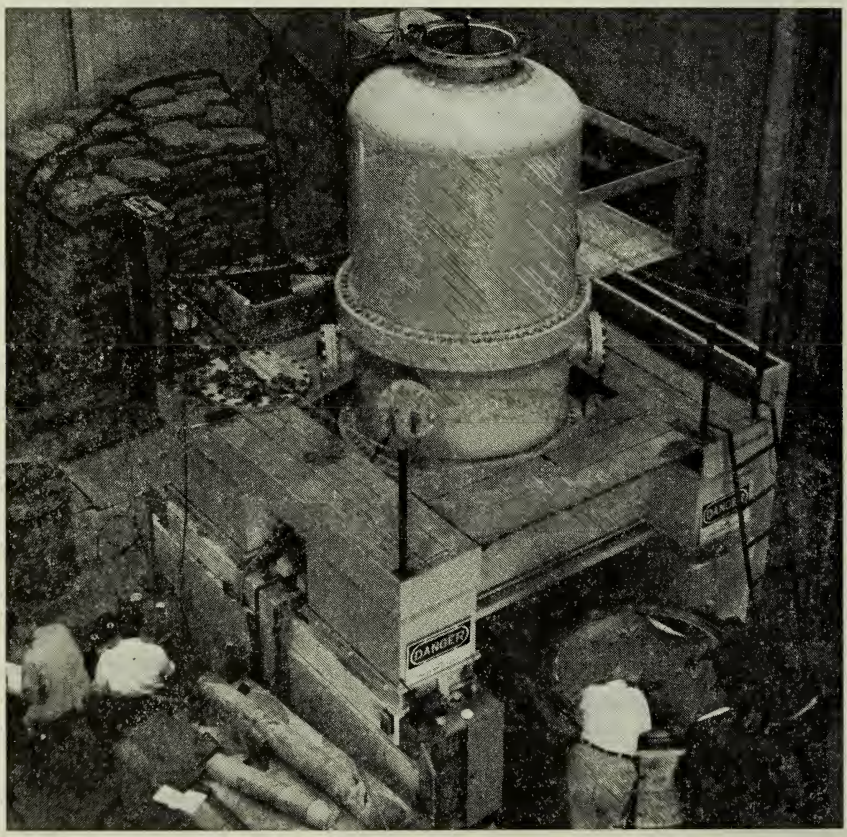
Hydraulic Engineering Laboratory

The main laboratory pumping system is composed of five pumps with a combined capacity of 5,000 gallons per minute at a head of about forty-five feet. Water storage and sump facilities, with a capacity in excess of 22,000 gallons, supply the water recirculation system. Piping arrangements are designed to permit simultaneous constant head and high rate flows without interference. A separate laboratory, containing its own pump, water supply, circulation system, and measuring apparatus, is maintained for the use of graduate students. This laboratory has instrumentation of the latest type. One channel area is 10 feet wide and 330 feet long, and it is equipped with a traveling crane for the handling of heavy equipment. This space is well adapted to studies relating to either open channel or pipe flow. Another area, 40 by 40 feet, is a watershed facility that can be controlled with computers for storms up to ten inches

of rainfall per hour. Available within the laboratory are complete shop facilities for the construction of research installations and models, including apparatus for molding plastic materials. Nearing completion is the new Hydrosystems Laboratory, a large addition to the Civil Engineering Building which will provide additional space and facilities for hydraulic and hydrologic research and study.

Talbot Laboratory

Graduate students in civil engineering often elect courses which make use of the Department of Theoretical and Applied Mechanics laboratories



This equipment in the new Structural Dynamics Laboratory can apply a pulse loading pressure ranging up to 900 pounds per square inch over a four-foot diameter surface with a time of application of three milliseconds or longer. In addition, it has a capability of sustained steady loading of indefinite duration, and a controlled pressure decay in times as short as ten to fifteen milliseconds.

located in Talbot Laboratory. The facilities include a hydraulic laboratory, which is equipped with a standpipe, pumps, weirs, orifice tanks, turbines, long concrete channels, and other facilities for instruction and research in hydraulics; the applied mechanics laboratory, equipped with standard and special testing machines of various types and capacities; and the fatigue of metals laboratory, equipped with a variety of machines for testing metals under fatigue loading.

The Highway Materials Laboratories in Talbot Laboratory are equipped for tests and research in bituminous materials and mixes, as well as in stabilized soils, soil-aggregate mixtures, and other nonbituminous highway materials.

Engineering Hall

This building has offices for members of the staff, classrooms, a graduate study room, a student lounge, the Engineering Library, the offices of the College of Engineering, the Engineering Experiment Station, and some offices of the Institute of Aviation.

Portions of civil engineering facilities, including the Construction Engineering and Management Programs, are located in Engineering Hall. Scientific methods for conceptualizing, analyzing, planning, and controlling of construction operations are being developed in this program. Here extensive use is made of the Burroughs B5500 computer system in the Civil Engineering Systems Laboratory.

Traffic Engineering Laboratory. This laboratory, designed for teaching and research, is located in Engineering Hall. It contains a traffic signal demonstration panel which can be operated individually or collectively with all types of modern electronic signal controllers, radar speedmeters, traffic counters, a twenty-pen recorder, a traffic operations model, volume or density computer, and other technical equipment, including a research vehicle.

Photogrammetric and Geodetic Engineering Laboratories

The Photogrammetric Engineering Laboratory is among the best equipped in the world. Available modern photogrammetric equipment includes: Wild STK-1 stereocomparator, DBA-701 plate comparator, Wild A-7 autograph, Kern PG-2 stereoplotter, Wild B-8 aviograph, B & L Twinplex

plotter, Zeiss stereotope plotter, Zeiss SMK-40 and Wild C-12 stereometric cameras, and two Galileo-Santoni terrestrial cameras.

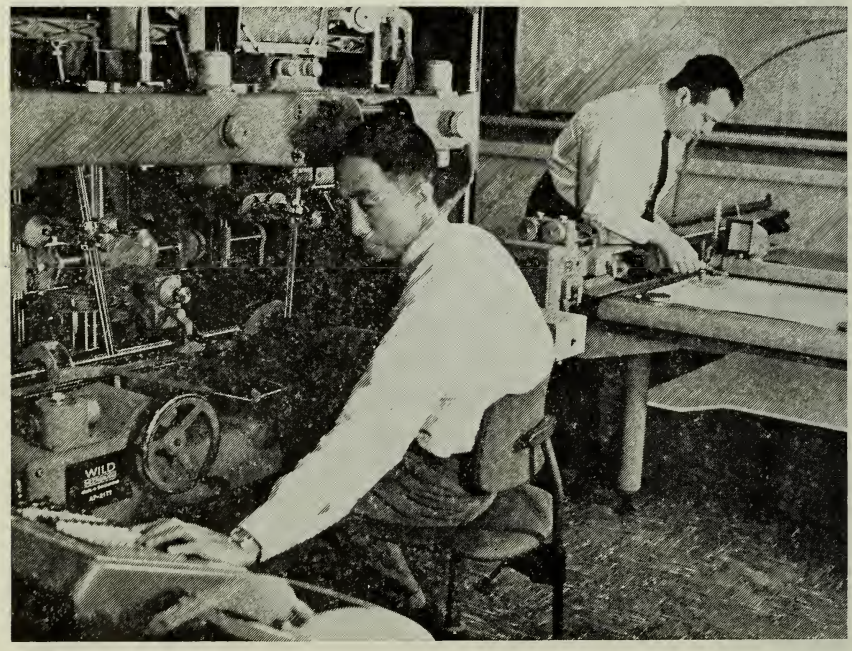
An extensive collection of modern geodetic instruments is available in the Geodetic Engineering Laboratory.

Highway Materials Research Laboratory

Extensive facilities are available for evaluating paving materials and for studying the behavior of pavements under static and repeated dynamic loads along with facilities to assimilate various weather and climatic conditions. The pavement research and study areas consists of three single-story buildings plus outside area for storage and handling of materials.

Highway Pavement Testing Laboratory

This building contains new facilities for conducting the standard tests on paving materials, plus many pieces of special equipment designed at the



In the photogrammetric and geodetic engineering laboratories, the concept of digital terrain models is being studied by using a modern stereoplotter that is equipped with an automatic digital readout unit.

University of Illinois. Facilities are available for handling and processing the large quantities of materials needed in the test pavements, including a mixer for blending concrete and stabilized paving materials, a small but complete hot-mix plant, compaction tools, and special equipment for pulverizing the soil and adjusting the water content.

The pavement behavior test area contains a test track in which either static or repeated dynamic loads can be applied to model pavements. Static loads up to 80,000 pounds can be applied to the test pavements as well as repeated wheel loads in excess of 3,000 pounds. The wheel loads can be applied at a rate of more than a quarter-million load applications per week. The pavement test area contains equipment for adjusting the water table below the test pavements and for control of the temperature and humidity of the atmosphere immediately above the test pavements.

Library

The University of Illinois Library ranks first among state universities in its size, and the resources for advanced study and research are outstanding. Its present collections now exceed 4,312,500 volumes, all but about 389,300 of them located in Urbana.

In addition to the figures for cataloged volumes cited, the University Library contains approximately 560,500 pamphlets, 373,000 maps and aerial photographs, and 308,900 music scores and parts. More than 20,000 periodicals and newspapers are currently received.

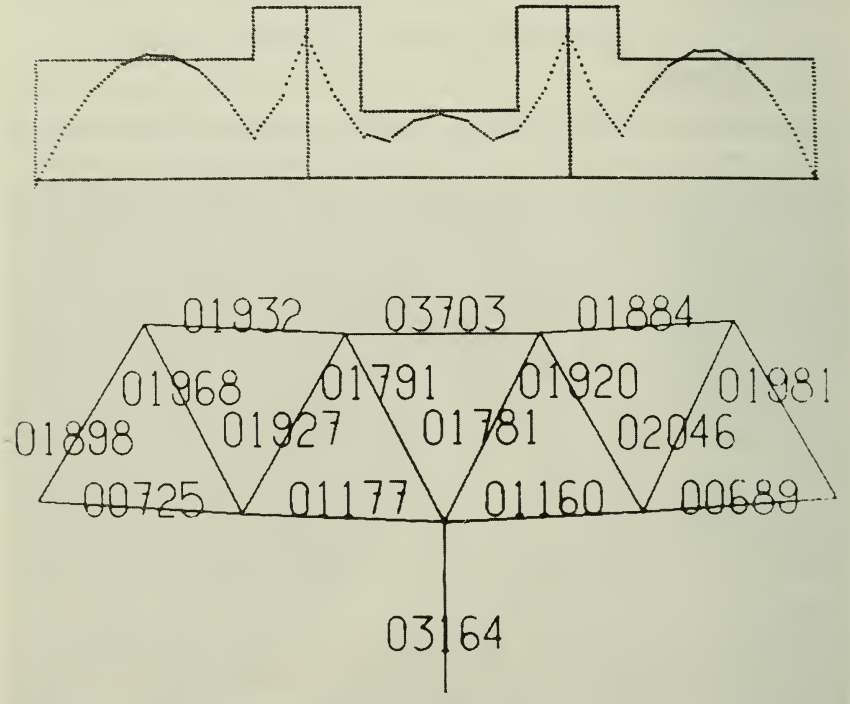
The Library's bibliographical facilities comprise a general catalog of more than 5,000,000 cards, a union catalog of titles owned by about two dozen major American and foreign libraries; printed catalogs of libraries, e.g., the Bibliothèque Nationale, British Museum, and Library of Congress; national and trade bibliographies of all countries for which such works have been issued; bibliographies of special subjects; and similar aids.

Outstanding collections have been developed in the science-technology fields. The Engineering, Physics, Mathematics, Chemistry, and Geology libraries are located near the College of Engineering. Their combined collections include more than 5,000 journal titles and 203,000 books. Graduate students have free access to all library bookstacks. Microreproduction and photo duplication facilities, interlibrary loan service from other institutions for those engaged in research for dissertations, individual

reference service, and assistance in using the collections, catalogs, and indexes are also available.

Computational Aids

Available for civil engineering research are a number of computational aids for use in numerical methods, studies such as the numerical solution of stress analysis problems, instability, vibration, impact, heat flow, and for data reduction and processing. For advanced study and research, the department has a Burroughs B5500 computer system located in Engineering Hall in support of the remote terminal building management project of the Civil Engineering Systems Laboratory.



Above are graphic outputs from on-line computer-aided design studies carried on by graduate students. The top picture is a continuous beam design, with a curve of the required section modulus superimposed on a section modulus layout provided by a designer. The bottom picture is a truss design, with numerical values of strains superimposed on the deflected shape.

The Department of Computer Science, located in the Digital Computer Laboratory, has available computing facilities for study use. An IBM computing system 360, consisting of direct coupled model 50 and 75 processors, is available for general University use in research and instruction. The department is constructing a high-speed computer of its own design (Illiac IV). Extensive program libraries are available for the various systems. In addition to general programs, many special purpose programs developed by civil engineering staff members and graduate students are available for the static and dynamic analysis and design of a variety of complex structures, for data reduction, for traffic and equipment allocation studies, for train performance simulation, for planning construction operations, and for many other research problems. Students with no previous program experience may take the non-credit course, Computer Science 400.

The use of these computing facilities make investigations possible involving complex computations which are impracticable or even impossible by other means and greatly expand the scope of both the analytical and design-oriented, as well as some phases of experimental research.

COURSES IN CIVIL ENGINEERING AND SANITARY ENGINEERING

The prerequisite for graduate work in civil engineering and sanitary engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in the branch of the subject in which registration is desired.

Courses numbered from 300 to 399 are open to advanced undergraduate and graduate students. Those numbered 400 and above are open to graduate students only.

Courses for Graduates and Advanced Undergraduates

301. Advanced Surveying. Precise horizontal and vertical control surveys; state plane coordinate systems; special construction surveys. ½ unit. Prerequisite: Civil Engineering 202 or consent of instructor.

304. Fundamentals of Analytical Photogrammetry. An introduction to the basic principles, procedures, and methods of analytical photogrammetry, including relative and absolute orientation, and strip and block adjustment. ¾ or 1 unit. Prerequisite: Civil Engineering 203 and 306 or consent of instructor.

305. Observational Astronomy. Same as Astronomy 314. Astronomical coordinate systems and transformations; theory of, and practice in, approximate and precise determinations of latitude, longitude, and time; introduction to theory of errors; theory and practice of astronomical photography. 1 unit. Prerequisite: Astronomy 102 or 210, or Civil Engineering 201; Mathematics 142 or 143.

306. Adjustment of Observations. A study of the methods of least squares and its application to the adjustment of photogrammetric and geodetic problems; formation and solution of the normal equations, including the use of matrix algebra; types of adjustments including adjustments for hybrid systems; discussion of the normal distribution and the statistical foundations of the method of least squares. ¾ or 1 unit. Prerequisite: Mathematics 315 and Civil Engineering 202, or consent of instructor.

307. Photogrammetric Engineering. A study of metrical photography in civil engineering practice, analytical and analogue photogrammetric systems, photometrics and outer space mapping techniques, and automated photographic mapping systems. ¾ or 1 unit. Prerequisite: Civil Engineering 203 or consent of instructor.

314. Fundamentals of Systems Approach. Introduction to the application of linear programming, network theory, and queueing theory to the synthesis of civil engineering systems. ½ or 1 unit. Prerequisite: Civil Engineering 215; Mathematics 263 or consent of instructor.

315. Construction Productivity. Introduction to the application of scientific principles to the measurement of and the forecasting of productivity in construction engineering; conceptual and mathematical formulations of the labor, equipment, and material factors affecting productivity. ½ or 1 unit. Prerequisite: Civil Engineering 215; credit or registration in Mathematics 263 or equivalent; or consent of instructor.

316. Construction Planning. Introduction to the application of scientific principles to the normative planning of construction operations. ½ or 1 unit. Prerequisite: Civil Engineering 315 or consent of instructor.

318. Construction Cost Analyses and Estimates. Introduction to the application of scientific principles to costs and estimates of costs in construction engineering; concepts of and statistical measurements of the factors involved in direct costs, general overhead costs, cost mark-ups and profits; the fundamentals of cost recording for construction cost accounts and cost controls. ½ or 1 unit. Prerequisite: Civil Engineering 315 or consent of instructor.

321. Bituminous Materials and Mix Design. Properties and control testing of bituminous materials; analysis of bituminous paving mixtures; composition and design of asphaltic concrete and soil-asphalt mixes. ½ unit. Prerequisite: Civil Engineering 214 and 220, or consent of instructor.

322. Development of Highway Facilities. Analysis of factors in developing a highway transportation facility; traffic estimates and assignment; problems of highway geometrics and design standards; planning and location principles; intersection design factors; street systems and terminal facilities; programming

improvements; drainage design; structural design of surface; concepts of highway management and finance; highway maintenance planning. 1 unit. Prerequisite: Civil Engineering 220 or consent of instructor.

325. Highway Traffic Characteristics. Vehicle operating characteristics; driver characteristics; pedestrian characteristics; roadway characteristics as they individually, and collectively as traffic stream characteristics, are related to the planning, design, and operation of highway facilities. ½ unit. Prerequisite: Civil Engineering 220 or consent of instructor.

333. Urban and Regional Transportation. Importance of transportation and its relation to urban and regional planning; problems of demand; characteristics of transport systems; transportation planning including surveys, data analysis, and problems of administration and finance; coordination and integration of transport. ½ or 1 unit. Prerequisite: Consent of instructor.

334. Airport Design. Basic principles of site selection for airports and fundamental considerations of design, construction, and maintenance of airport pavements and structures. ½ or 1 unit. Prerequisite: Civil Engineering 220 and senior standing in civil engineering, or consent of instructor.

335. Railway Construction and Maintenance. Loads and load distribution on track and subgrade; roadbed construction and stabilization; track stresses, design, and materials; turnouts and crossings; maintenance programs. ½ or 1 unit. Prerequisite: Consent of instructor; credit or registration in Civil Engineering 230 for those with a minor in railroad or transportation engineering.

336. Railway Location and Operation. Influence of traffic, alignment, distance, gradients, and motive power upon operating expenses; mechanics of train operation; economic design of location. ½ or 1 unit. Prerequisite: Consent of instructor; credit or registration in Civil Engineering 230 for those with a minor in railroad or transportation engineering.

337. Signals. Train movements; systems of signals; track circuits; track capacity; interlockings; economics of signaling. ½ or 1 unit. Prerequisite: Consent of instructor; credit or registration in Civil Engineering 230 for those with a minor in railroad or transportation engineering.

338. Terminals. Design and operation of freight terminal facilities for rail, highway, air, and water carriers; passenger terminals and parking lots; terminal requirements for commodity categories; coordination. ½ or 1 unit. Prerequisite: Consent of instructor; credit or registration in Civil Engineering 230 for those with a minor in railroad or transportation engineering.

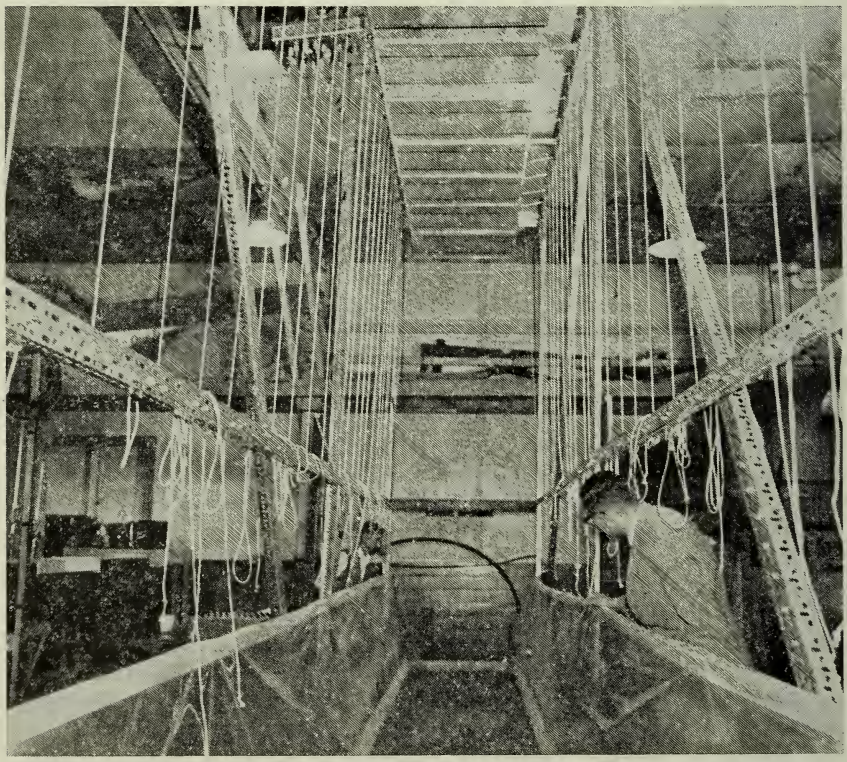
345. Environmental Health Engineering. The application of engineering principles to the control of environmental sanitation and communicable disease control, including administration, biostatistics, epidemiology, vector control, pesticides, milk and food sanitation, swimming pools, individual water supply and wastewater disposal, plumbing, refuse collection and disposal, industrial hygiene and air pollution, radiological health and international health. ¾ unit. Prerequisite: Consent of instructor.

346. Biology of Polluted Water. The significance of biology in water quality, stream pollution, and waste treatment. ½ unit. Prerequisite: Consent of instructor.

349. Fundamentals of Radiation Protection. Same as Nuclear Engineering 349. Principles and practice of health physics and radiation protection engineering, including such topics as: principles of dosimetry; sources of ionizing radiation; determination of radiation tolerances; dosimetric instruments; standards and regulations. ¾ or 1 unit. Prerequisite: Nuclear Engineering 397 or Physics 382, or equivalent.

351. Hydromechanics. Applied fluid mechanics with particular reference to topics in hydraulic design, analysis, and research in civil engineering areas; covers dimensional analysis and dynamic similarity, analysis of potential flow, boundary-layer problems, turbulence and diffusion. Hydraulic transients, water waves, transport phenomena. ¾ unit. Prerequisite: Theoretical and Applied Mechanics 235; Civil Engineering 251.

352. Water Resources Design. Study and evaluation of phases of river mechanics; water resources history and project implementation; development of a water resources project plan. ¾ unit. Prerequisite: Civil Engineering 250; Theoretical and Applied Mechanics 235.



With a rain simulator, the mechanics of sheet flow and impact of raindrops can be studied, both experimentally and theoretically. Raindrops from this simulator can be dropped from various heights up to sixteen feet.

353. Hydraulic Structures. Introduction to the design of hydraulic structures, including consideration of types and function of dams; hydrologic design; hydraulic design of spillways and outlet works; determination of loads and stresses for concrete structures; seepage, piping, and stability of earth structures. ¾ unit. Prerequisite: Civil Engineering 250 and 251.

354. Hydraulic Engineering Laboratory. Fundamental principles, operation, and use of model laboratories; dimensional analysis; hydraulic similitude; theory and design of hydraulic models as applied to a specific laboratory problem. ¾ unit. Prerequisite: Theoretical and Applied Mechanics 235.

356. Hydraulics of Surface Drainage. Applications of hydraulics and hydrologic principles; elements of channel design, hydrologic determination of design flow; flow through bridge openings and other obstacles; hydraulics of drainage areas; overland flow; runoff from highways; runways and urbanized areas; hydraulics of storm-drain systems; culvert design. ¾ or 1 unit. Prerequisite: Theoretical and Applied Mechanics 235; Civil Engineering 250 or consent of instructor.

361. Advanced Structural Analysis. A unified development of force and displacement analysis methods for linearly elastic framed structures including introduction to matrix methods of formulation. Applications to plane and space frames and trusses; computer use. ¾ or 1 unit. Prerequisite: Civil Engineering 262 or equivalent.

363. Behavior and Design of Metal Structures, II. Members under combined loads; welded, riveted, and bolted connections; moment-resistance connections; plastic design. ¾ or 1 unit. Prerequisite: Civil Engineering 263 or consent of instructor.

364. Reinforced Concrete Design, II. Limit design of continuous reinforced concrete members and slabs of various types. ¾ or 1 unit. Prerequisite: Civil Engineering 264; credit or registration in Civil Engineering 262.

366. Behavior of Reinforced Concrete Members. Ultimate strength and behavior of reinforced concrete members and relation between results of research and current specifications for design; members subjected to flexure, axial compression, combined flexure and axial load, combined flexure and shear, and bond. 1 unit. Prerequisite: Bachelor of Science in civil engineering or architecture with courses in structures and reinforced concrete design.

368. Prestressed Concrete. Principles and methods of linear prestressing; behavior, strength, and design of noncomposite simple beams, composite simple beams, and continuous beams; time-dependent variables and long-time deflections. ¾ or 1 unit. Prerequisite: Civil Engineering 262 and 264.

369. Behavior and Design of Wood Structures. Theory and practice in design of modern wood structures; effect of plant origin and physical structure of wood on its mechanical strength; fasteners and their significance in design and the development of design formulae. ¾ or 1 unit. Prerequisite: Civil Engineering 261 or equivalent, or consent of instructor.

374. Introduction to Structural Dynamics. Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multi-degree-of-freedom systems; response spectrum concepts; simple inelastic structural systems; introduction to systems

with distributed mass and flexibility. ¾ or 1 unit. Credit will not be given for both Civil Engineering 374 and Theoretical and Applied Mechanics 311. Prerequisite: Theoretical and Applied Mechanics 212; Mathematics 345; Civil Engineering 261; or equivalent.

379. Applied Structural Mechanics. Study of beams under lateral load; beams with combined lateral load and thrust; buckling; beams on elastic foundations; applications of Fourier series and virtual work principles to beam-type structures; stress and strain in three dimensions; applications to flexure of beams and plates and to contrained torsion; elements of the engineering theory of plates. ¾ or 1 unit. Prerequisite: Mathematics 345 and one undergraduate course in statically indeterminate structures, or consent of instructor.

383. Soil Mechanics. Identification, description, and classification of soils; index properties, weight-volume relationships; hydraulic properties; stress-deformation characteristics; ultimate strength; subsurface exploration; character of natural soil deposits. ¾ or 1 unit. Prerequisite: Consent of instructor.

384. Applied Soil Mechanics. Application of soil mechanics to foundations of buildings; stability of earth slopes; earth pressure and retaining walls; braced cuts; damage due to construction operations. ¾ or 1 unit. Prerequisite: Civil Engineering 383 or consent of instructor.

385. Engineering Aspects of Surficial Soils. Use of geologic and pedologic information and airphoto interpretation techniques in the prediction of engineering properties of soils and the planning of engineering soil surveys. Field trip; estimated expense, $5.00. 1 unit. Prerequisite: Civil Engineering 210 or consent of instructor.

391. Computer Methods in Civil Engineering. Review of programming concepts; formulation and programming of numerical, data-processing, and logical problems with applications to various branches of civil engineering; organization of programs and data; development and use of problem-oriented programming languages in civil engineering. ½ or 1 unit. Prerequisite: Computer Science 101 or 400, or equivalent, or consent of instructor.

Courses for Graduates

403. Analogue Photogrammetry, I. Study of the fundamental concepts of the analogue approach in photogrammetry; characteristics, capabilities, and limitations of analogue photogrammetric data reduction systems; theory of errors of interior and exterior orientation, methods of relative and absolute orientation; model deformations; critical surfaces. 1 unit. Prerequisite: Civil Engineering 203 or consent of instructor.

404. Analogue Photogrammetry, II. Two- and three-dimensional aerotriangulation, auxiliary data; propagation of errors; strip and block adjustment; design criteria for aerotriangulation projects. 1 unit. Prerequisite: Civil Engineering 403 or consent of instructor.

405. Analytical Aerotriangulation. Iterative and simultaneous rigorous block adjustment methods, numerical methods for the solution of large systems of equa-

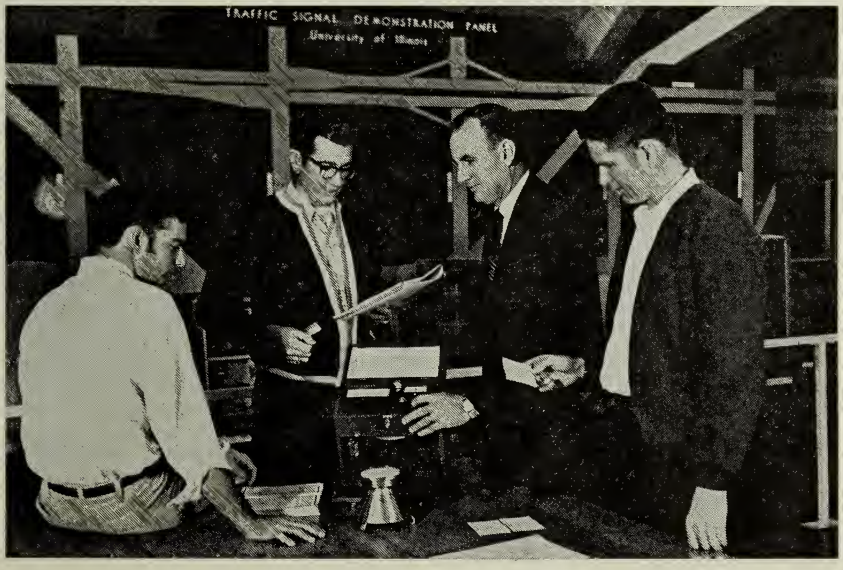
tions; characteristics of various analytical photogrammetric systems. 1 unit. Prerequisite: Civil Engineering 304 or consent of instructor.

416. Design of Construction and Industrial Operations, I. Same as Industrial Engineering 416. Conceptual development of a systems design procedure for optimal design of construction and industrial operations; general forms required for critical path networks, linear programs, theory of queues and inventory models required for systems design; design evaluation and control models. 1 unit. Prerequisite: Bachelor of Science in civil or industrial engineering; credit or registration in Mathematics 363; or consent of instructor.

417. Design of Construction and Industrial Operations, II. Same as Industrial Engineering 417. Continuation of Civil Engineering 416. 1 unit. Prerequisite: Civil Engineering or Industrial Engineering 416; credit or registration in Mathematics 315; or consent of instructor.

420. Pavement Design, I. Analysis and methods of measurement of surface properties related to vehicle performance; factors affecting pavement durability; traffic wear, climate, chemical action, combined effects; composition design of flexible and rigid pavements for proper surface properties, load carrying capacity, wear resistance, stability, and durability. 1 unit. Prerequisite: Civil Engineering 220 or equivalent.

421. Pavement Design, II. Structural design of flexible and rigid pavements; loading characteristics, static, impact and repeated loads; load distribution through pavement layers, factors affecting distribution, methods of analysis; evaluation of subgrade support; criteria for selecting design values. 1 unit. Prerequisite: Civil Engineering 220 or equivalent.



An instructor discusses the use of a low-intensity light meter with students in the traffic engineering laboratory. The equipment is being used in conjunction with a research project that deals with the criteria for rural intersection illustrations.

422. Fundamental Properties and Behavior of Bituminous Mixtures. Composition and theories of physical structure of bitumens; rheological, failure, durability, and adhesive properties of bitumens and bituminous mixtures; analysis of factors influencing the performance of bituminous aggregate mixtures. 1 unit. Prerequisite: Civil Engineering 321 or consent of instructor.

423. Highway Materials Stabilization. Stabilization of aggregates and soils with cement, lime, bituminous materials, and other stabilizing agents; basic stabilization reactions, properties of stabilized materials, and composition design are emphasized. 1 unit. Prerequisite: Civil Engineering 220 or consent of instructor.

426. Traffic Planning. Traffic engineering planning functions; urban and rural master traffic plans; traffic analyses for new or existing streets, highways, and terminal facilities. 1 unit. Prerequisite: Civil Engineering 325 or equivalent.

427. Geometric Highway Design. Highway classification; highway capacity; highway design controls; sight distance; horizontal and vertical alignment; cross section elements; highway types; controlled access highways; design of at-grade intersections, grade separations, and interchanges. 1 unit. Prerequisite: Civil Engineering 325 and 426, or consent of instructor.

428. Traffic Engineering Operations. Theory of traffic control; laws and ordinances; design and application of traffic control devices; special street designations; parking design and control; street illumination; miscellaneous traffic control designs. 1 unit. Prerequisite: Civil Engineering 325 and 426, or equivalent.

435. Railway Construction and Maintenance. Roadbed load capacity; track stresses; economic design of track; economics of maintenance; review of specific projects. 1 unit. Prerequisite: Civil Engineering 335.

436. Railroad Location and Operation. Track and traffic capacity; optimum train size, performance, and scheduling train performance simulation and analysis; optimum size of plant and modern location. 1 unit. Prerequisite: Civil Engineering 336 or consent of instructor.

440. Theory of Water Treatment. Properties of water and criteria of water quality; gas transfer operations in water treatment; chemical treatment processes; corrosion and corrosion control; sedimentation; filtration; disinfection; control of aquatic growths; control of tastes and odors. 1 unit. Prerequisite: Chemistry 122 and Microbiology 101.

441. Analysis and Treatment of Water and Waste Water. Physical, biological, and chemical analysis of water and waste water; field sampling techniques; removal of objectionable impurities, principles of disinfection; determination of dissolved oxygen, biochemical oxygen demand, and chemical oxygen demand; nitrogen, sulfur, and phosphorous compounds in waste waters. 1 unit. Prerequisite: Credit or registration in Civil Engineering 440.

442. Theory of Waste-Water Treatment. Composition, properties, and analysis of wastes; microbiology of waste treatment; pollution of natural waters; sedimentation; chemical treatment; aerobic and anaerobic treatment processes; disposal of waste sludges. 1 unit. Prerequisite: Civil Engineering 346; Chemistry 122; Microbiology 101.

443. Advanced Sanitary Engineering Laboratory. Experimental and pilot plant studies of the operational characteristics for various physical, chemical, and

biological unit operations and processes used in the treatment of water and waste water. 1 unit. Prerequisite: Civil Engineering 441; credit or registration in Civil Engineering 442.

444. Industrial Water and Wastes Treatment. The theory and application of unit operations unique to the treatment of industrial water and wastes; advanced consideration of industrial waste problems of major industries; techniques of saline water conversions. 1 unit. Prerequisite: Credit or registration in Civil Engineering 440 and 442, or consent of instructor.

445. Water Quality and Pollution. Water quality standards and criteria for various beneficial uses; transport mechanisms for pollution in surface streams and ground water; fate of pollution and pollution control. 1 unit. Prerequisite: Civil Engineering 250 and 251; Mathematics 345.

446. Design of Water and Waste Treatment Plants. A study of the fundamental factors affecting choice of treatment units and combination of unit processes into an integrated plant. 1 unit. Prerequisite: Civil Engineering 440, credit or registration in Civil Engineering 442, or consent of instructor.

447. Radioactive Waste Disposal. Same as Nuclear Engineering 447. Sources and characteristics of radioactive wastes; methods of treatment; ultimate disposal; fate of radioisotopes in the environment; permissible levels in air and water; current levels in water supplies; water treatment methods; monitoring techniques; solid waste disposal; gaseous wastes disposal; air monitoring; and reactor site selection and hazards evaluation. ½ or 1 unit. Prerequisite: Physics 282, or Chemistry 398 or Nuclear Engineering 398, or consent of instructor.

448. Control of Air Pollution. A study of air contaminants from all types of sources; deleterious effects of contaminants on plants, animals, and materials; determination of source strength; basic theory of control devices; air pollution surveys; and organization of control programs. 1 unit. Prerequisite: General Engineering 360.

449. Analysis of Air Pollutants. Laboratory analysis of common air pollutants; theory of operation of laboratory and automatic field instrumentation. ½ or 1 unit. Prerequisite: Credit or registration in Civil Engineering 448.

450. Advanced Hydrologic Analysis and Design. Hydrologic cycle; hydrometeorology; collection of data; hyetograph and hydrograph analyses; infiltration and evapotranspiration studies; groundwater exploration and recharge; statistical analyses; determination of waterway areas; flood routing; river and reservoir regulations; design and planning of flood control projects; and modern development such as radar weather, radioactive tracers, disposal of nuclear wastes, and electronic analogs. 1 unit. Prerequisite: Bachelor of Science in civil engineering or consent of instructor.

452. Water Resources. An advanced interdisciplinary course on water resources planning and development; geographic aspects; data collection; governmental functions; hydrologic implications; river hydraulics; hydraulic physical units and water quality; economic aspects; legal, political, and social problems; case studies. 1 unit. Prerequisite: Consent of instructor.

457. Ground Water. An advanced interdisciplinary course on ground water; hydrogeology; hydrodynamics of flow through porous media; ground water

hydrology; hydraulics of wells; hydraulic analysis of seepage; ground water pollution; ground water resources. 1 unit. Prerequisite: Consent of instructor.

458. Open-Channel Hydraulics. Basic hydromechanics; flow types; channel characteristics; flow-profile computations; hydraulic jump analysis; design of nonerodible, erodible, and gassed channels and transitional structures; study of supercritical flow and unsteady flow; modern developments in theory and design practice; application of numerical method, method of characteristics, method of singular point, and electronic digital computers and analogs. 1 unit. Prerequisite: Bachelor of Science in civil engineering or consent of instructor.

461. Matrix Formulation of Structural Analysis. Development of structural analysis algorithms in matrix formation: force and displacement vectors and transformations, element property matrices, representation of structures as assemblages of elements, displacement and force methods of analysis, selected advanced topics. 1 unit. Prerequisite: Civil Engineering 361 or equivalent.

463. Optimization of Structures. Structural design processes; formulation of problems in the optimization of structures; optimization of structural elements; minimum volume principles; use of mathematical programming in optimization of structural systems. 1 unit. Prerequisite: Consent of instructor.

465. Structural Design in Metals. Theories of behavior of structural metal members and their components; interpretation of codes and specifications for the design of bridges and buildings. This course and Civil Engineering 475 form a unit in the study of theoretical and experimental investigations. 1 unit. Prerequisite: Bachelor of Science in engineering with courses in structures.

467. Behavior of Reinforced Concrete Structures. Ultimate strength and behavior of statically indeterminate reinforced concrete structures; applicability of elastic analysis to framed structures; analysis and design of floor slabs in buildings. 1 unit. Prerequisite: Civil Engineering 366.

469. Thin Shell Structures. Fundamental membrane and bending theories of shells; application of theories to analysis and design of folded plates and cylindrical rotational, and translational shells; membrane stresses and deflections; and approximate bending solutions by variational, finite-difference, and finite-element methods. 1 unit. Prerequisite: Civil Engineering 473 or consent of instructor.

470. Structural Safety and Reliability. Development of concepts and methods of probabilistic structural mechanics relevant to the analysis of structural safety and reliability. Concepts of probability and stochastic processes; statistical considerations of loads and structural resistances; engineering significance of statistical extremes; factor of safety and failure probability; prediction of system reliability; design for safety against natural destructive forces including wind and earthquakes. 1 unit. Prerequisite: Graduate standing; consent of instructor.

471. Numerical and Approximate Methods of Structural Analysis. Methods of successive approximations and numerical procedures for the solution of complex problems with applications to bridges, buildings, and aircraft structures: influence lines, moments and deflections of beams with axial load, buckling strength of columns, moments and deflections of beams resting on elastic or plastic supports, vibration of beams, analysis of arches, moments and deflections of plates, other problems. 1 to 2 units.

472. Advanced Numerical Methods in Engineering. Basic concepts in numerical and approximate methods: successive approximations, relaxation, finite differences, ordinary boundary value problems, initial value problems, partial differential equations, characteristic value problems, methods of interpolation, variational procedures. Special study of selected topics including vibrations, buckling, and torsion of various structural elements. 1 to 2 units. Prerequisite: Civil Engineering 471.

473. Analysis and Design of Plates and Shells. Fundamental theories of bending and buckling of plates; practical application of theories in analysis and design of reinforced concrete bridge and building floors, highways and airport pavements, and structural plate components in metal; theory of shells with application to tanks, pressure vessels, shell roofs, and hipped plate construction. 1 to 2 units. Prerequisite: Consent of instructor.

474. Dynamics of Framed Structures. Advanced treatment of the dynamics of multi-degree of freedom framed structural systems. Fundamental concepts of eigenvalue theory of real matrices and energy principles of dynamics as bases for a unified approach to dynamical problems of structural assemblages. Structural idealization, principles of dynamics, Lagrange's equation, response calculations, normal mode method and its limitations, transfer matrix approach; computer utilization. 1 unit. Prerequisite: Civil Engineering 361 or 374, or equivalent.

475. Behavior of Steel Structures. A critical evaluation of the actual behavior of metals, connections, members, and structures; the significance of this behavior in terms of design and the development of design specifications. This course and Civil Engineering 465 form a unit in the study of theoretical and experimental investigations. 1 unit. Prerequisite: Graduate standing in civil engineering or theoretical and applied mechanics.

476. Plastic Analysis and Design. Inelastic behavior of metal structural frameworks; concept of the plastic hinge; collapse configurations; analysis of collapse mechanisms; requirements for stability; deflections, incremental collapse, shakedown; connections; optimum design; grid frameworks. 1 unit. Prerequisite: Civil Engineering 465 or consent of instructor.

477. Design of Structures for Dynamic Loads. Nature of dynamic loading from blasts; dynamic behavior of structures; criteria for design of blast-resistant structures. 1 unit. Prerequisite: Civil Engineering 374; consent of instructor.

478. Discrete Methods of Solid and Structural Mechanics. Concepts and methods for the discrete formulation and solution of structural and solid mechanics problems. Discrete idealization of solid media and structures by lumped-parameter and finite element approaches; stress analysis and wave propagation in plane and axi-symmetric solids; analyses of plate and shell structures; inelasticity and non-linearity; special boundary conditions; special problems including soil and rock mechanics problems, and structure-medium interaction. 1 unit. Prerequisite: Civil Engineering 379, Aeronautical and Astronautical Engineering 326 or Theoretical and Applied Mechanics 351 or equivalent, and registration in Computer Science 400 or equivalent, or consent of instructor.

480. Earth Pressures and Retaining Structures. Classical and modern earth pressure theories and their experimental justification; pressures and bases for

design of retaining walls, bracing of open cuts, anchored bulkheads, cofferdams, tunnels, and culverts. 1 unit. Prerequisite: Credit or registration in Civil Engineering 384.

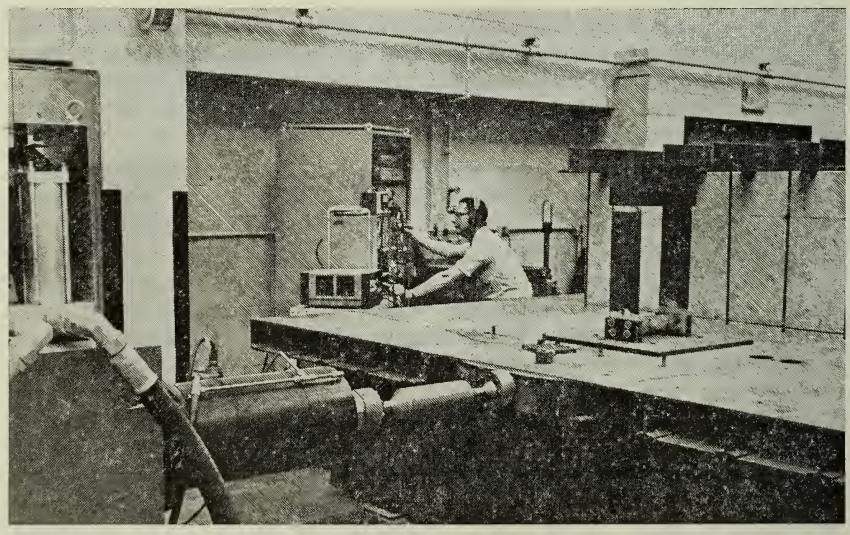
481. Earth Dams and Related Problems. Fundamentals of problems of slope stability; seepage in composite sections and anisotropic materials; methods of stability analysis; mechanism of failure of natural and artificial slopes; compaction; field observations, 1 unit. Prerequisite: Credit or registration in Civil Engineering 384 or consent of instructor.

482. Advanced Soil Mechanics, I. Theoretical and experimental studies in soil mechanics; stress distribution in homogeneous and stratified soils; theory of consolidation for multidirectional flow, and time dependent loading; numerical methods; secondary consolidation; settlement analyses; experimental measurements. 1 unit. Prerequisite: Civil Engineering 383.

483. Advanced Soil Mechanics, II. Theoretical and experimental studies in soil mechanics; shearing properties of saturated soils; physical properties of partially saturated soils; physico-chemical properties of clays; laboratory direct shear and triaxial shear testing. 1 unit. Prerequisite: Civil Engineering 383.

484. Foundation Engineering. Critical study of case histories of projects in foundation engineering; current procedure for design and construction of foundations, embankments, and waterfront structures. 1 unit. Prerequisite: Civil Engineering 384.

485. Soil Engineering for Transportation Facilities. Problems of soil classification; evaluation of stability of natural and compacted soils as subgrades, slopes, and embankments; effect of climate, soil properties, compaction, and admixtures on subgrade stability. 1 unit. Prerequisite: Civil Engineering 383 or equivalent.



The earthquake simulator responds to commands stored in tapes. Models of structures that weigh up to five tons can be subjected to earthquake motions and can be accurately tested.

494. Municipal Administration and Engineering. Legal authority of municipalities, forms of municipal government; municipal functions, organization, and management; city finance; engineering functions of city government; city planning and zoning; building codes and inspection; street lighting; public utilities; city cleaning; recreational development. 1 unit. Prerequisite: Bachelor of Science in civil engineering or consent of instructor.

495. Civil and Sanitary Engineering Seminar. Discussion of current topics in civil and sanitary engineering and related fields by staff, students, and visiting lecturers. Course may be repeated. 0 or ¼ unit.

497. Special Problems. Individual investigations or studies of any phase of civil engineering selected by the student and approved by his adviser and the staff member who will supervise the investigation. 0 to 4 units. Prerequisite: Consent of instructor.

499. Thesis Research. 0 to 4 units.

Suggested Topics for Civil Engineering 497 (Special Problems)

Regular courses have been established to cover many phases of civil engineering. Even so, students may wish to take advantage of Civil Engineering 497 for special studies. In most areas, extensive use is made of Civil Engineering 497 to cover subjects not now included in the regular courses. Examples of possible topics include:

CONSTRUCTION ENGINEERING AND MANAGEMENT

Construction Productivity . . . Network-Theory-Based Construction Planning . . . Computer-Based Accounting and Estimating . . . Computer-Based Management Systems . . . Operations Research in Construction Management.

HYDRAULIC ENGINEERING

Water Waves and Coastal Engineering . . . Watershed Hydraulics and Urban Hydrology . . . Sedimentation in Rivers and Reservoirs . . . Operations Research in Water Resources Planning and Development . . . Stochastic Hydrology.

PHOTOGRAMMETRIC AND GEODETIC ENGINEERING

Photogrammetric Qualities of Non-Conventional Photography (T.V., X-Rays, Holography, Panoramic Photography, etc.) . . . Digital Terrain Models . . . Advanced Photogrammetric Systems . . . Satellite Geodesy . . . Extraterrestrial Mapping . . . Design and Analysis of Photogrammetric and Geodetic Systems by Computer Simulation . . . Integrated Surveying Systems . . . Cadastral Surveying.

PLAIN CONCRETE

Nature of the Constituent Materials of Concrete . . . Quality Control and Specifications . . . Durability of Concrete . . . Creep and Relaxation of Concrete . . . Fatigue and Fracture of Concrete.

SANITARY ENGINEERING

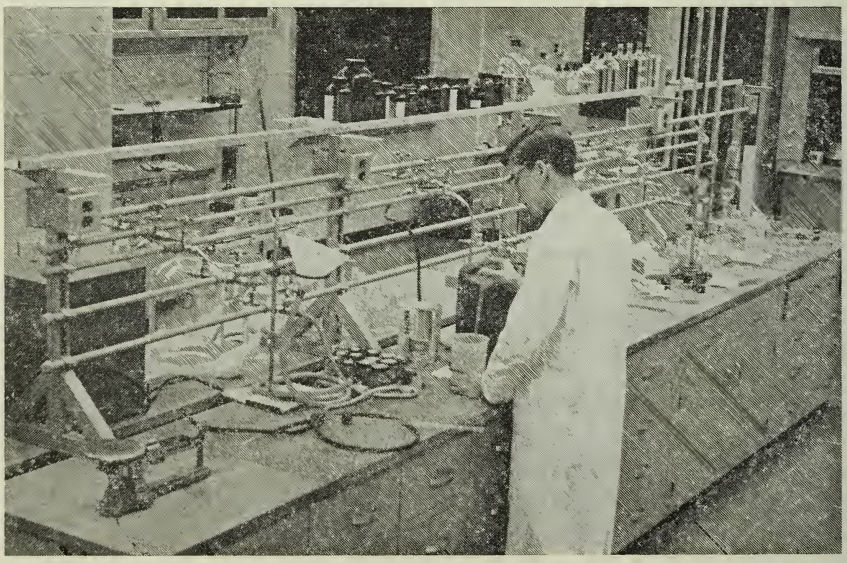
Stream Pollution . . . Water Quality Aspects of Water Resources . . . Air Pollution . . . Solid Waste Management . . . Radiological Health . . . Chemical, Physical, and Biological Aspects of Water Supply and Pollution Control.

SOIL AND ROCK MECHANICS

Soil and Rock Dynamics . . . Soil-Structure Interaction Problems . . . Physicochemical Properties of Soils . . . Soil Stabilization . . . Fundamentals of Rock Mechanics . . . Quantitative Terrain Analysis.

STRUCTURAL ENGINEERING

Structural Mechanics . . . Probability and Stochastic Processes . . . Structural Theory: Instability, Limit Analysis, Matrix, and Network Methods . . . Structural Dynamics . . . Shell Structures . . . Prestressed and Reinforced Concrete Structures . . . Riveted, Bolted, and Welded Joints . . . Fatigue and Fracture of Metal Structures.



This is one of several sanitary engineering laboratories used for chemical and biological studies of water and waste water treatment.

SYSTEMS ANALYSIS AND DESIGN

Computer-Aided Design . . . Network Modeling of Engineering Systems . . . Data Processing Systems . . . Optimization and Synthesis . . . Problem-Oriented Languages.

TRANSPORTATION

Planning, Systems Design, and Operations. Design of Transport Systems . . . Environmental Factors in Transportation . . . Technological Development of Transport Media . . . Waterways, Airways, and Pipelines.

Materials and Structural Design of Roadways. Properties and Performances of Aggregates . . . Properties of Bituminous Materials and Mixes . . . Pavement Analysis and Behavior . . . Soil and Material Stabilization.

Highway Traffic Engineering. Organization and Management . . . Traffic Records and Accident Analyses . . . Maintenance and Operations . . . Analyses of Traffic Problems . . . Roadway Location and Design . . . Traffic Flow Theory.

Railway Engineering. Stresses in Track . . . Track and Roadway Structures . . . Problems in Railway Management . . . Train Performance Simulation and Analysis.

COURSES OFFERED IN OTHER DEPARTMENTS

Many of the other departments at the University offer courses for graduate credit which are open to students in civil engineering. A partial list of departments offering such courses are: Agronomy, Chemistry and Chemical Engineering, Computer Science, Economics, Geography, Geology, Mathematics, Microbiology, Nuclear Engineering, Physics, Sociology, Theoretical and Applied Mechanics, and Urban Planning.

SUGGESTED PROGRAMS FOR THE MASTER'S DEGREE

From the courses offered in civil engineering and in other departments, the student may select a variety of programs of study. He is assisted by his adviser in selecting courses which complete his background of fundamental work and advance his knowledge in one of the fields of specialization in civil engineering. Study beyond the degree of Master of Science

is an individual matter, and each program is carefully reviewed and selected by the student and his adviser. The following programs may help the student evaluate the possibilities in specific fields.

Construction Engineering and Management

This program is designed to prepare a student for the profession by further developing his analytical abilities, increasing his capability to recognize and solve a wide variety of construction-management problems, and developing a genuine interest in broadening his scientific horizons. A master's degree program could include courses Civil Engineering 314 through 318, 391, 416, and 417; Mathematics 363; and approved electives or thesis.

Hydraulic Engineering

Hydraulic engineering courses are available to graduate students specializing in the areas of hydromechanics, hydraulic structures, hydrology, and water resources. Recommended programs emphasize the study of basic subjects and yet provide flexibility to pursue a well-balanced curriculum to meet the needs of the individual student's background and interest. Areas in which a student may select electives are groundwater geology, economics, mathematics, statistics, sanitary engineering, theoretical and applied mechanics, and computer applications.

A typical program leading to a master's degree in civil engineering, in the areas of hydromechanics and hydraulic structures, could include Civil Engineering 351, 353, 450, 458, 495 (seminar), 497, and approved electives. For students pursuing a master's degree in the areas of hydrology and water resources, Theoretical and Applied Mechanics 335 may replace Civil Engineering 351, and Civil Engineering 352 would replace Civil Engineering 353.

Photogrammetric Engineering

A wide range of courses in this area provides the student the option of selecting either a specialized program in photogrammetry or a broad program in the general field of photointerpretation and photogrammetry. Sufficient flexibility is maintained in either program to provide the can-

didate with a combination of courses to best meet his individual capabilities and needs. In photogrammetry, a recommended program could include Civil Engineering 391, 403, 404, 497, or 499, and electives would include Mathematics 315, 363, and 387. In a program involving photointerpretation and photogrammetry, a student could take Civil Engineering 383, 384, 385, 403, 404, 497, or thesis, and the electives could include Geography 378 and Geology 301.

Sanitary Engineering

Proper selection of electives provides the student with the option of selecting either a broad program in sanitary engineering or concentration in one of four special areas: water supply and pollution control, solid waste management, radiological health, or air pollution. A master's degree program would include courses in civil engineering and approved electives in microbiology, chemistry, mathematics, nuclear engineering, physics, physiology, fluid mechanics, or other fields. A typical program could consist of Civil Engineering 345, 440, 442, a sanitary engineering laboratory course, a biology course, a thesis or special problem, and approved electives.

Soil and Rock Mechanics

The students, by proper selection of courses, may obtain a broad background for design and construction in earth and rock materials, or he may specialize in the static or dynamic properties of soils and rocks, in field behavior, or in principles of design. A typical program leading to the Master of Science degree might include Civil Engineering 383, 384, 385, 391, 480 through 484, and Geology 450 and 493.

Structural Engineering

Courses offered in this field may lead to specialization in reinforced concrete and structural metals, theory and analysis, structural and soil dynamics, nuclear structural engineering, and other areas. A typical balanced program would include one or more units from civil engineering courses in: Structural Analysis (Civil Engineering 379, 461, and 470 through 474); Structural Design (Civil Engineering 369, 465, 476, and 477); Behavior of Structures (Civil Engineering 366, 467, and 475); Soil Mechanics and Foundation Engineering (Civil Engineering 383, 384, and

480 through 485) ; and Systems Analysis and Design courses. In addition, a balanced program should include one or more units of electives from such areas as mathematics, theoretical and applied mechanics, or physics.

Systems Analysis and Design

This program in civil engineering is founded upon two precepts inherent in the systems approach. First, the ability to make the proper decisions is based upon the logical process of analyzing factual information and structural techniques; and second, the engineer learns how to resolve civil engineering problems by applying information processes founded upon mathematical concepts of probability, statistics, network theory, matrix theory, and linear programming. A balanced program for a master's degree includes at least four units selected from Civil Engineering 314, 315, 316, 318, 352, 391, 450, 452, 461, 470, and 497; Econmoics 470. Approved electives include Economics 374 and 474, and Mathematics 361.

Transportation

A wide variety of courses are offered which cover engineering and related activities in the field of transportation. The graduate student may select a program dealing with the concepts and problems common to all modes of transportation such as planning, systems design, and operations; materials, and structural design of roadways; or he may choose a program related to a specific mode by taking courses in highway traffic engineering or railway engineering. A normal program would include basic and related civil engineering courses along with approved electives offered by other departments. Students may select a program of courses from the following groups.

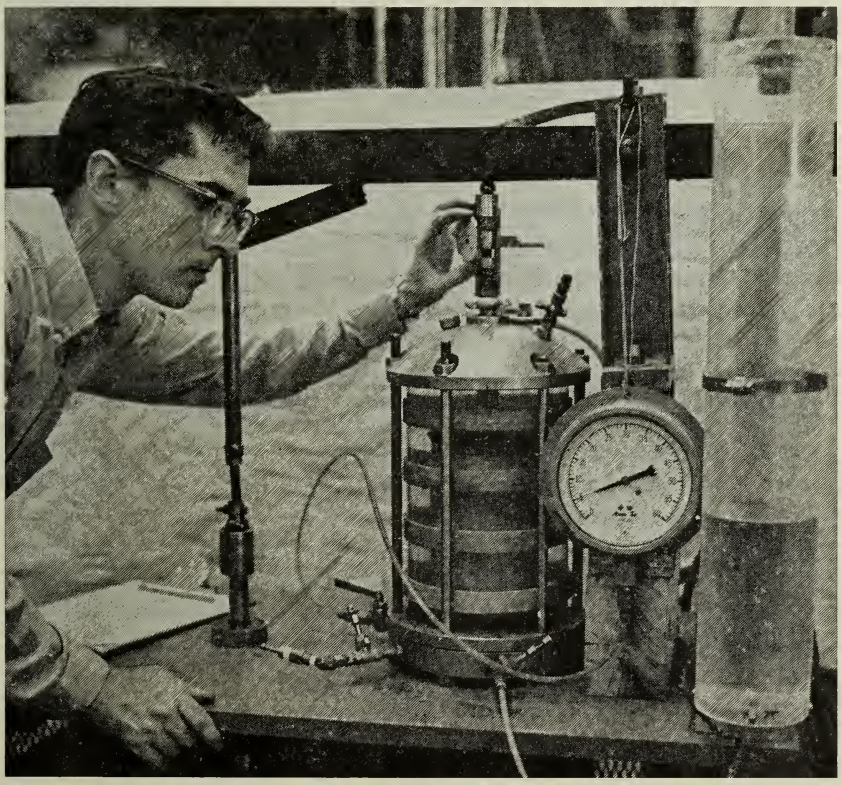
Planning, Systems Design, and Operations. This deals with the concepts of planning a transportation system and the technological aspects of design and operation of the systems. Basic courses in civil engineering are Civil Engineering 322 through 334, 336, 338, 426, 497, or 479. Related courses are Civil Engineering 314, 316, 416, 427, 428, 436, or 494. Elective courses may be selected from economics, geography, mathematics, or urban planning.

Materials and Structural Design of Roadways. This concerns the theories and behavior of materials and soils as related to the structural aspects of transportation facilities. Basic courses in civil engineering are Civil Engi-

neering 321, 335, 368, 369, 383, 384, 420, 421, 422, 426, 435, 482, 485, 495, 497, or 499. Related courses are Civil Engineering 322, 325, 366, 427, or 473. Elective courses may include computer applications, geology, industrial engineering, or theoretical and applied mechanics.

Highway Traffic Engineering. Basic courses in civil engineering are Civil Engineering 322, 325, 426, 427, 428, 495, 497, or 499. Related courses are Civil Engineering 301, 314, 333, 356, 416, 417, 420, 421, or 494. Elective courses may include economics, geography, sociology, or urban planning.

Railway Engineering. Basic courses in civil engineering are Civil Engineering 335 through 338, 435, 495, 497, or 499. Related courses are Civil Engineering 314, 356, 383, or 485. Electives may include economics or geography.



In the construction of flexible pavements, base materials are subjected to repeated loads in a triaxial cell. A graduate student is measuring a specimen of crushed limestone with equipment he helped to develop.

Urban Planning and Management

With a steadily increasing percentage of the population in the United States living in urban areas, there is a growing concern at all levels of government, from local to federal, with the many problems created by the urban growth. Civil engineers are directly and intimately concerned with the physical facilities that make up the urban complex and they are becoming involved in many ways in the planning and management of the urban community. As municipal engineers, public works directors, and city managers, civil engineers need a broad background of advanced training not only in civil engineering, but in many other disciplines which influence their decisions.

The variety of courses offered by these other disciplines at the University of Illinois provides an excellent opportunity for graduate study by civil engineering students interested also in urban planning and management. Because of the variety of combinations possible, specific programs of courses are not listed.

Engineer Officers Programs

Special programs for officers in the Air Force, Army Corps of Engineers, and Navy Civil Engineering Corps are available. These programs are designed to meet the particular needs of the different services. Because of the wide variety of courses that are offered, the programs can be tailored to suit the backgrounds, capabilities, and interests of each student officer.

The basic course is one of twelve month's duration which includes advanced work in a broad range of civil engineering study. Other programs, from eighteen to twenty-four months' duration, provide for greater specialization in such fields as structural dynamics, systems analysis (construction engineering, operations research), urban and regional planning, engineering physics, nuclear engineering, and water resources. All of these special programs possess sufficient flexibility, through electives, to permit the development of programs that are compatible with the needs and interests of both the student officers and the Department of Defense services that they represent. Suggested programs in these several specialties may be obtained from the Head of the Department of Civil Engineering.

CALENDAR[1] OF THE GRADUATE COLLEGE

1969

January 2, Thursday, 1:00 p.m.... Christmas vacation ends.

Jan. 13, Mon.-Jan. 21, Tues..... Semester examinations.

January 20, Monday..... Last day for finals for the doctoral degree in February.

January 27, Monday..... Last day for candidates for the doctoral degree in February to deposit theses and abstracts.

Second Semester, 1968-1969

Jan. 30, Thurs.-Feb. 1, Sat. to noon ..... Graduate registration. (Authorization cards distributed on alphabetical basis.)

February 1, Saturday..... Last day for registration without payment of late registration fine.

February 3, Monday..... Instruction begins.

February 15, Saturday..... Last day for application for fellowships for 1969-1970.

February 28, Friday..... Applications to take the Russian examination on March 14 will not be accepted in Graduate College Office after this date.

March 1, Saturday..... Earliest date to apply for National Defense Student Loan fund for 1969-1970.

March 14, Friday evening..... Russian examination.

March 21, Friday..... Last day to add a course or to change credit from units to hours or from hours to units.

March 22, Saturday..... Last day for preliminary examination for the Ph.D. degree if thesis credit earned during the semester is to apply to the third stage of program.

March 29, Saturday, 1:00 p.m..... Spring vacation begins.

April 7, Monday..... Last day to drop a course.

April 7, Monday, 1:00 p.m..... Spring vacation ends.

April 11, Friday..... Applications to take the Russian examination on April 25 will not be accepted in Graduate College Office after this date.

[1] The Graduate College catalog contains a detailed calendar of events.

April 23, Wednesday.....Advance enrollment for continuing students begins.

April 25, Friday.....Russian examination.

April 25, Friday.....No names will be added to the June graduation list after this date.

April 30, Wednesday.....Advance enrollment for continuing students ends.

May 2, Friday.....Honors Day. Classes dismissed at noon.

May 12, Monday.....Last day for candidates for the doctoral degree in June to submit theses to Graduate College Office for approval of format.

May 16, Friday.....Last day for candidates for the master's degree in June to submit theses to Graduate College Office for approval of format.

May 23, Friday.....Last day for candidates for the master's degree in June to deposit theses.

May 26, Monday.....Last day for finals for the doctoral degree in June.

May 26, Mon.-June 4, Wed.....Semester examinations.

May 30, Friday.....Memorial Day (holiday).

June 2, Monday.....Last day to apply for National Defense Student Loan funds for 1969-1970.

June 2, Monday.....Last day for candidates for the doctoral degree in June to deposit theses and abstracts.

June 14, Saturday.....Commencement exercises.

Summer Session, 1969

June 16, Mon.-June 17, Tues.....Graduate registration. (Authorization cards distributed on alphabetical basis.)

June 17, Tuesday.....Instruction begins.

July 4, Friday.....Independence Day (holiday).

July 11, Friday.....Applications to take the Russian examination on July 25 will not be accepted in the Graduate College Office after this date.

July 11, Friday.....Last day to add a course or to change credit from units to hours or from hours to units.

July 21, Monday.....Last day to drop a course.

July 25, Friday evening.....Russian examination.

July 28, Monday.....Last day for candidates for the master's degree in August to submit theses to Graduate College Office for approval of format.

August 4, Monday.....No names will be added to the August graduation list after this date.

August 7, Thursday.....Last day for candidates for the master's degree in August to deposit theses.

Aug. 8, Fri.-Aug. 9, Sat.....Summer session examinations.

August 29, Friday.....Last day for candidates for the master's degree in October to submit theses to Graduate College Office for approval of format.

September 5, Friday.....Last day for candidates for the doctoral degree in October to submit theses to Graduate College Office for approval of format.

September 15, Monday.....Last day to file application for the masters' degree in October.

September 22, Monday.....Last day for candidates for the master's degree in October to deposit theses.

September 22, Monday.....Last day for finals for the doctoral degree in October.

September 29, Monday.....Last day for candidates for the doctoral degree in October to deposit theses and abstracts.

Deadline Dates For Submitting Applications For Admission or Readmission in September, 1969

July 30, Wednesday.....Last day for foreign students who have *not* attended a college or university in the United States to apply for admission in September, 1969.

August 27, Wednesday.....Last day for domestic students, or foreign students who have attended a college or university in the United States, to apply for admission or readmission in September, 1969.

First Semester, 1969-1970

Sept. 11, Thurs.-Sept. 13, Sat. to noon.....Graduate registration.

September 15, Monday.....Instruction begins.

November 26, Wednesday, 1:00 p.m.....Thanksgiving vacation begins.

December 2, Monday, 1:00 p.m...Thanksgiving vacation ends.

December 20, Saturday, 1:00 p.m..Christmas vacation begins.

UNIVERSITY OFFICES

Office of Admissions and Records
100a Administration Building
Urbana, Illinois 61801

Graduate College
330 Administration Building
Urbana, Illinois 61801

Department of Civil Engineering
Civil Engineering Building
Urbana, Illinois 61801

Housing Division
420 Student Services Building
Champaign, Illinois 61820

Office of Foreign Student Affairs
310 Student Services Building
Champaign, Illinois 61820

Student Financial Aids Office
707 South Sixth Street, Room 109
Champaign, Illinois 61820

University offices are open Monday through Friday
from 8:00 a.m. to 12:00 noon and
from 1:00 to 5:00 p.m. except on holidays.